

RECENT MARINE OSTRACODA (CRUSTACEA) FROM DARWIN AND NORTH-WESTERN AUSTRALIA

H.V. HOWE

Department of Geology, Louisiana State University
Baton Rouge, Louisiana 70803, U.S.A.

K.G. MCKENZIE

School of Applied Science, Riverina-Murray Institute of Higher Education
PO Box 588, Wagga Wagga, NSW 2650, Australia.

Present address: Department of Geology, University of Melbourne,
Parkville, Victoria 3052, Australia.

ABSTRACT

The Recent marine Ostracoda (excluding Myodocopida) from Darwin, Northern Territory and Port Hedland and Hamelin Pool, Shark Bay, Western Australia are described and figured. The large fauna comprises over 130 species of which 38 are new, 61 previously described and about 30 are left in open nomenclature; there is also a new subspecies. The seven new genera are: *Hedlandella* McKenzie gen. nov. (type species *H. gesae* sp. nov.); *Parakeijia* McKenzie gen. nov. (type species *P. territoriae* sp. nov.); *Praemunitia* Labutis gen. nov. (type species *P. broomensis* (Hartmann, 1978)); *Labutisella* McKenzie gen. nov. (type species *L. darwinensis* sp. nov.); *Bradyleberis* McKenzie gen. nov. (type species *B. cristatella* (Brady, 1880)); *Actinoleberis* McKenzie gen. nov. (type species *A. arafurae* sp. nov.); and *Yassinicythere* McKenzie gen. nov. (type species *Y. basionii* (Hartmann, 1978)).

The new species are: *Eupolycope occidentesnuda* sp. nov., *Cytherelloidea darwinensis* sp. nov.; *Cytherelloidea trilirata* sp. nov.; *Paracypris occidentslevis* sp. nov.; *Paradoxostoma dorsostrata* sp. nov.; *Cytherois bentleyi* sp. nov.; *Paracytheroma hamelinensis* sp. nov.; *Neomonoceratina porcostata* sp. nov.; *Microcytherurua rugosella* sp. nov.; *Microcytherura punctatella* sp. nov.; *Xestoleberis paramargaritea* sp. nov.; *Xestoleberis darwinensis* sp. nov.; *Microxestoleberis hamelini* sp. nov.; *Hedlandella gesae* sp. nov.; *Hedlandella parva* sp. nov.; *Loxoxoncha minyaustralis* sp. nov.; *Loxoconcha judithae* sp. nov.; *Microcythere logani* sp. nov.; *Callistocythere warnei* sp. nov.; *Callistocythere neili* sp. nov.; *Callistocythere rhine* sp. nov.; *Keijia nordaustraliae* sp. nov.; *Parakeijia territoriae* sp. nov.; *Gambiella pytta* sp. nov.; *Mackenziartia bentleyi* sp. nov.; *Praemunitia hartmanni* sp. nov.; *Labutisella darwinensis* sp. nov.; *Labutisella interrupta* sp. nov.; *Labutisella quadrata* sp. nov.; *Labutisella curta* sp. nov.; *Mutilus curvicostatus* sp. nov.; *Orionina territoriae* sp. nov.; *Quasibradleya elongata* sp. nov.; *Jugosocythereis henryhowei* McKenzie sp. nov.; *Actinoleberis arafurae* sp. nov.; *Australimoosella paenenuda* sp. nov.; *Neocytheretta ventrocostata* sp. nov.; *Cytherura nordoccidentalis* sp. nov.; and the new subspecies is *Tanella gracilis* Kingma, 1948 *darwinii* subsp. nov.

KEYWORDS: Crustacea, Ostracoda, marine, new taxa, Darwin, north-western Australia.

INTRODUCTION

The marine ostracode fauna of north-western and northern Australia was little known prior to the post-war period. True, during 1874 H.M.S. *Challenger* had sampled off Cape York Peninsula in Torres Strait (Station 185, Lat 11° 35'S., Long. 144° 3'E., depth about 282.5m) and near Booby Island (Station 187, Lat. 10°36'S., Long. 141°55'E.,

depth about 11-14.5m). These stations yielded an useful total of 46 species (Brady 1880). And there had been earlier records from Indonesia (Brady 1868, 1869). However, the taxonomy was basic and the illustrations poor by modern standards so that constant reference to Brady's types at the Hancock Museum, Newcastle-upon-Tyne and in the British Museum (Natural History), London is a necessity. There were also some

early records of Myodocopida; these can be gleaned from Mueller (1912).

After 1945 there have been several major taxonomic contributions to the regional ostracode fauna. Kingma (1948) concentrated on Indonesian Neogene fossil taxa but included some Snellius Expedition samples from the Java Sea. These yielded 19 species, several of them described previously by Brady in the references cited above. Keij (1953) also worked with Snellius Expedition material including a few Sahul Shelf samples but most of the 14 species recorded by him in this paper had already been described. Subsequent papers by Keij — a complete list is provided in McKenzie and Sudijono (1981) — have dealt with particular genera and covered the whole Indo-westpacific. Meanwhile, the monographs by Poulsen (1962, 1977) are basic aids for identifying regional myodocopid Ostracoda since, although they deal with world faunas, Poulsen (1977) noted that Indonesian seas had the richest myodocopid populations. Recently, Kornicker (1986) has begun to work with northern Australian myodocopids.

In an ecological context, McKenzie (1976) and McKenzie, *et al.* (1979) listed assemblages of genera with environmental affinities characteristic of Long 110°E., Sahul Shelf and the Arafura Sea. These provide specialists with an understanding of regional generic diversity, especially in podocopid ostracodes.

The most valuable contribution of all to date is undoubtedly that by Hartmann (1978). He listed 102 species, all Podocopida, and included descriptions of 68 new species, three new genera and two new tribes, with some associated ecological parameters. His descriptions are detailed and the illustrations are excellent. In particular, his paper incorporates 14 high quality plates of scanning electron micrographs. Another feature of Hartmann's work is that it deals with coastal taxa whereas most previous records were from offshore environments. Our paper provides the taxonomy of nearshore podocopid, platycopid and cladocopid Ostracoda collected by the senior author in 1963 from Port Hedland and Hamelin Pool, Shark Bay, north-western Australia, and by the junior author in September 1975 from Darwin, Northern Territory. The assemblages all consist of shells only.

We use a question mark before a genus name (e.g. ? *Orlovibairdia*) to indicate some uncertainty as to the correctness of the generic assignment; and we use "cf." before a species name to indicate that our material is referable to, but possibly not identical with that species.

The following abbreviations are used: ad., adult; juv., juvenile; B, breadth; H, height; L, length; LV, left valve; RV, right valve; SEM, scanning electron microscope; DN, Darwin, Northern Territory, September 1975, coll. K.G. McKenzie; HPSB, Hamelin Pool, Shark Bay, Western Australia, 1963, coll. H.V. Howe; PH1, oyster bed next to swimming pool, Port Hedland, Western Australia, 1963, coll. H.V. Howe; PH2, between swimming pool and town, Port Hedland, Western Australia, 1963, coll. H.V. Howe; NTM, Northern Territory Museum, Darwin, Australia.

All measurements are in millimetres.

SYSTEMATICS

Order Cladocopida Sars

Family Polycopidae Sars

Genus *Eupolycope* Chavtur

Eupolycope occidentsnuda sp. nov.

(Figs 17, 53)

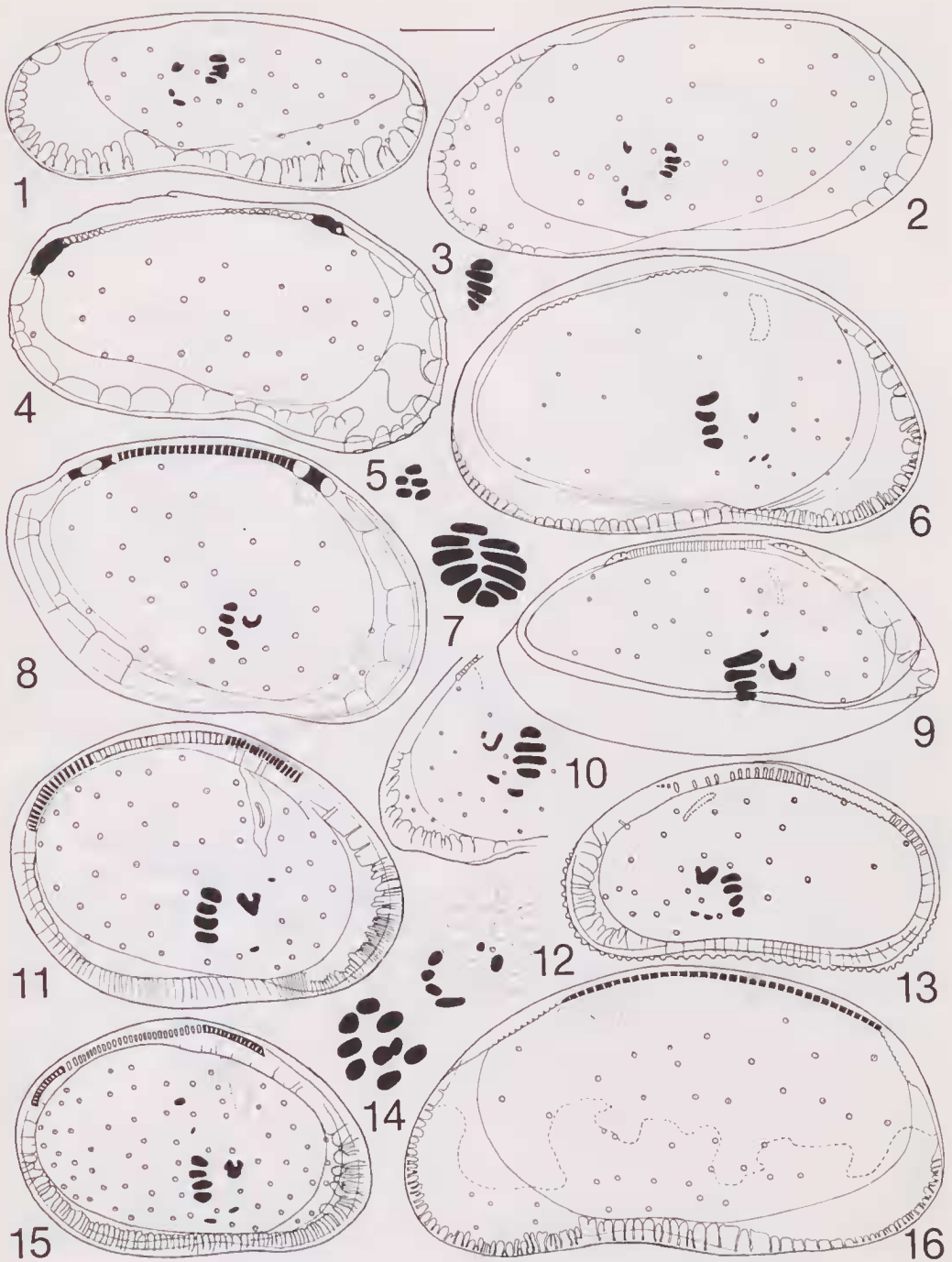
Type material. HOLOTYPE — ad. carapace, NTM Cr. 005632, HPSB. PARATYPES — 6 specimens on assemblage slide, HPSB, in NTM.

Description. Carapace small, subcircular, compressed, smooth; anterior truncated with barely discernible spinules at either terminus; posterior broadly rounded; dorsum regularly convex; venter similar. Inner lamellae narrow, slightly expanded antero-ventrally; no marginal pore canals; normal pore canals scattered, simple; hinge adont, short (0.12mm) and straight, located posterodorsally; three central adductor muscle scars, clustered in a tight rosette. Sex dimorphism not determined.

Dimensions. Holotype — L, 0.32; H, 0.26; B, 0.15.

Etymology. *occidens* (L.) — west, *nuda* (L.) = smooth.

Notes. Few cladocopids are known from Australasia and this is the first Recent Australian species to be described since Brady (1880). At 0.32mm, it is only half the size of *Polycope orbicularis* Sars and lacks



Figs 1-16. Camera lucida drawings: 1, *Paracytheroma hamelinensis*, ♂, paratype, internal RV; 2, *Paracytheroma mangrovicola*, internal RV; 3, *Dentibithere* sp. detail muscle scars; 4, *Callistocythere keiji*, ♀, internal LV; 5, *Propontocypris* sp., detail muscle scars; 6, *Xestoleberis* cf. *dougiamasorum*, ♀, internal LV; 7, *Cytherelloidea darwinensis*, paratype, detail muscle scars; 8, *Loxoconcha georgei*, ♀, internal LV; 9, *Microxestoleberis hamelini*, ♂, holotype, slightly oblique internal LV; 10, *Xestoleberis* cf. *portagustensis*, ♀, anterior internal RV; 11, *Xestoleberis paramargaritea*, ♀, paratype, internal LV; 12, *Jugosocythereis henryhowei*, ♀, paratype, detail muscle scars; 13, *Hedlandella gesae*, ♀, paratype, internal RV; 14, *Paranesidea onslowensis*, detail muscle scars; 15, *Xestoleberis darwinensis*, ♀, paratype, internal LV; 16, *Xestoleberis* cf. *exmouthensis*, ♀, internal RV. Scale line 0.1mm.

the long irregular pits of ? *Polycope favus* Brady, both recorded from Torres Strait (Brady 1880).

The taxonomy of living Cladocopida has been revised lately by Chavtur (1981) based on soft parts. In their absence, our placement of this species in his genus *Eupolycope* should be considered provisional.

Order Platycopida Sars
Family Cytherellidae Sars
Genus Cytherella Sars
***Cytherella semitalis* Brady**
(Fig. 37)

Cytherella semitalis Brady, 1868:72.

Material. 1 ad. ♂ carapace, NTM Cr. 005633, DN; 5 ad. ♂, 4 ad. ♀, and ca 100 juv., DN, in NTM.

Dimensions. NTM Cr. 005633 — L, 0.62; H, 0.32; B, 0.32.

Genus Cytherelloidea Alexander
***Cytherelloidea darwinensis* sp. nov.**
(Figs 7.39, 40)

Type material HOLOTYPE — ad. ♂ carapace, NTM Cr. 005634, DN. PARATYPES — 3 specimens on assemblage slide, DN, in NTM.

Description. Carapace elongate, subrectangular; compressed throughout in ♂, swollen posteriorly in ♀ with two embryo broodchamber; each valve characterised by strong engirdling ridge, interrupted mid-dorsally, rounded anteriorly, and squared off posteriorly; valve surface in part indistinctly punctate. Inner lamellae narrow, lacking true marginal pore canals; normal pore canals scattered, simple; hinge adont, ridge and groove type; central adductor muscle scars a feather-like biserial cluster occupying a dorsomedial depression in each valve. Sex dimorphism distinct, as noted earlier.

Dimensions. Holotype — L, 0.57; H, 0.26; B, 0.17.

Etymology. From the collection locality.

Notes. Two previously described congeneric Australian species can be compared with this taxon. It differs from *C. latimarginata* (Brady) in that the engirdling ridge of our species is distinct, not a broad and thickened marginal rim; also the length/height proportions are different. *C. cingulata* (Brady) on the other hand, has a similar ridge but this is interrupted posteriorly in the type

collection from Hong Kong (Brady 1869: Pl. 16, Fig. 24). Subsequently, Brady (1880) recorded *C. cingulata* from other localities, including Booby Island off Cape York Peninsula, but described the forms as having a rough and pitted surface. The figures indicate that he 'lumped' more than one species into *C. cingulata*. Some of these illustrations (Brady 1880: Pl. 43, Fig. 1e-g) resemble *C. darwinensis*.

***Cytherelloidea trilirata* sp. nov.**
(Fig. 38)

Type material. HOLOTYPE — ad. ♂ carapace, NTM Cr.005635, DN. PARATYPES — 1 ad. ♀ ad. ♀ carapace, NTM Cr.005798, DN; 1 ad. ♂ and 1 ad. ♀ carapace, 1 juv., DN, in NTM..

Diagnosis. A distinctive species that is smooth shelled and bears three well defined sagittal ridges on each valve. Sex dimorphism distinct; ♀s broader posteriorly with a two embryo broodchamber.

Dimensions. Holotype — L, 0.64; H, 0.32; B, 0.27. NTM Cr. 005798 — L, 0.67; H, 0.36; B, 0.32.

Etymology. *lirata* (L.) = ridged; *tri* (L., prefix) = three.

Genus Keijcyoidea Malz
***Keijcyoidea keiji* (McKenzie)**

Cytherelloidea keiji McKenzie, 1967:63;
Cytherelloidea keiji — Hartmann 1978:66;
Hartmann 1979:220; Hartmann 1980:112.

Material. 1 ad. ♂ RV, NTM Cr. 005636, PH1; 1 near — ad. RV, PH2, in NTM.

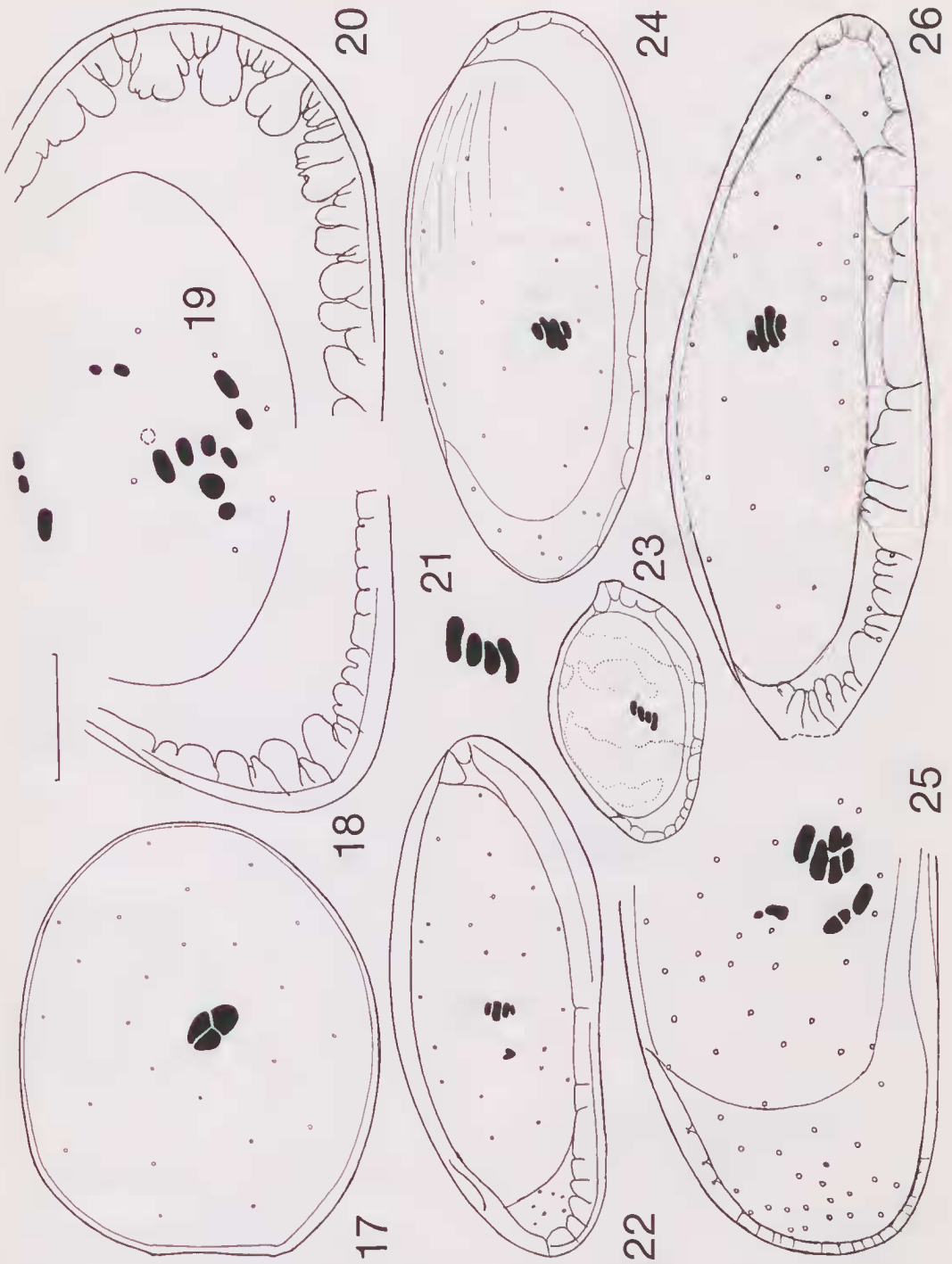
Dimensions. NTM Cr.005636 — L, 0.67; H, 0.38.

Order Podocopida Sars
Family Bairdiidae Sars
Genus Paranesidea Maddocks
***Paranesidea onslowensis* Hartmann**
(Figs 14, 43, 45)

Paranesidea onslowensis Hartmann, 1978: 71-72.

Material. 1 ad. ♀ RV, NTM Cr.005637, PH1; 4 carapaces, 10 RV, 15LV, including ad. of both sexes and juv., PH1, in NTM.

Dimensions. NTM Cr.005637 — L, 0.89; H, 0.53.



Figs 17-26. Camera lucida drawings: 17, *Eupolycope occidensnuda*, holotype, internal RV; 18-20, *Paracypris occidenslevis*; 18, ♂, holotype, posterior internal LV; 19, detail muscle sears; 20, ♂, holotype, anterior internal LV; 21, 23, *Paradoxostoma* sp., 21, detail muscle sears; 23, ♀, internal RV; 22, *Cytherois bentleyi*, ♂, holotype, internal RV; 24, *Paradoxostoma dorsostriata*, ♀, holotype, internal RV; 25, Paracypriid indet., internal RV (broken specimen, lost after illustration was completed); 26, *Xiphichilus* sp., ♀, internal LV. Scale line 0.1mm.

***Paranesidea parva* Hartmann**
(Fig. 46)

Paranesidea parva Hartmann, 1978:72.

Material. 1 ad. ♂ carapace, NTM Cr.005638, PH1 1 A-1? ♀ RV, NTM Cr.005639, PH1; 1 ad. ♂ LV, PH1 in NTM.

Dimensions. NTM Cr.005638 — L, 0.64; H, 0.36; B, 0.26; NTM Cr.005639 — L, 0.53; H, 0.33.

Genus *Bairdoppilata* Coryell, Sample and Fields

***Bairdoppilata balihaiensis* Hartmann**

Bairdoppilata balihaiensis Hartmann, 1978: 68-69.

Material. 1 ad. ♀ LV, NTM Cr.005640, PH1; 1 ad. ♂ RV, 1 ad. ♂ RV, 4 juv. LV, 8 juv. RV, PH1, in NTM.

Dimensions. NTM Cr.005640 — L, 0.98; H, 0.62.

Genus *Neonesidea* Maddocks

***Neonesidea rosaliae* Hartmann**

Neonesidea rosaliae Hartmann, 1978: 70.

Material. 1 ad. ♂ carapace, NTM Cr.005641, PH1; 1 ad. ♀ LV, NTM Cr.005642, PH1; 1 ad. ♀ RV, plus 1 carapace, 6 LV, 11 RV all juv., PH1, in NTM.

Dimensions. NTM Cr.005641 — L, 0.74; H, 0.41; B, 0.38. NTM Cr.005642 — L, 0.89; H, 0.54.

Genus *Papillatabairdia* Bentley

***Papillatabairdia* cf. *dentata* Bentley**

(Figs 42, 44)

Papillatabairdia dentata Bentley, 1982: 60.

Material. 1 ad. ♂ carapace, NTM Cr.005643, PH1; 10 LV, 5 RV including ad. both sexes and juv., PH1, in NTM.

Dimensions. NTM Cr.005643 — L, 0.61; H, 0.29; B, 0.30.

Family Bythocyprididae Maddocks

Genus *Orlovibairdia* McKenzie

?*Orlovibairdia* sp.

(Fig. 41)

Material. 1 ad. ♀ carapace, NTM Cr.005644, DN.

Dimensions. NTM Cr.005644 — L, 0.54; H, 0.29; B, 0.19.

Notes. Warm water species of *Orlovibairdia* McKenzie s.s. tend to be distinctly punctate whereas this form is smooth (like the cold water type species) hence the uncer-

tainty of the generic designation. *Pussella* Danielopol, 1973 is related but has a distinctively different shell and a Caribbean provenance.

Family Paracyprididae Sars

Genus *Paracypris* Sars

***Paracypris occidenslevis* sp. nov.**

(Figs 18-20, 54)

Type material. HOLOTYPE — ad. ♂ carapace, NTM Cr.005645, HPSB. PARATYPES — 47 on assemblage slide, HPSB, in NTM.

Description. Carapace moderately well calcified; medium sized; elongate bean-shaped in lateral view, smooth; dorsal margin regularly convex; venter sinuated medially; anterior broadly rounded; posterior subacuminate; regularly elliptical in dorsal view. Inner lamellae broad anteriorly and posteriorly, narrow ventrally; large anterior and posterior vestibules; marginal pore canals characteristically polyfurcated; normal pore canals scattered, simple, rimmed; hinge adont, comprising RV ridge and LV groove; central adductor muscle scars biserial (four + two) and typically paracypridid with fuleral scar, two large mandibular scars, plus two smaller in front and above and three dorsal scars directly above the central cluster. Sex dimorphism not confirmed because the material lacks adult ♀.

Dimensions. Holotype — L, 0.86; H, 0.39; B, 0.33.

Etymology. *occidens* (L.) = west; *levis* (L.) = smooth, polished.

Notes. This species is distinctly larger than *P. bradyi* McKenzie and has a different marginal pore canal branching pattern. Also it tolerates a more saline environment than that species which lives in normal salinities in Port Phillip Bay, near Melbourne, Victoria. In Hamelin Pool, on the other hand, salinities double those of the sea are not unusual.

Genus *Phlyctenophora* Brady

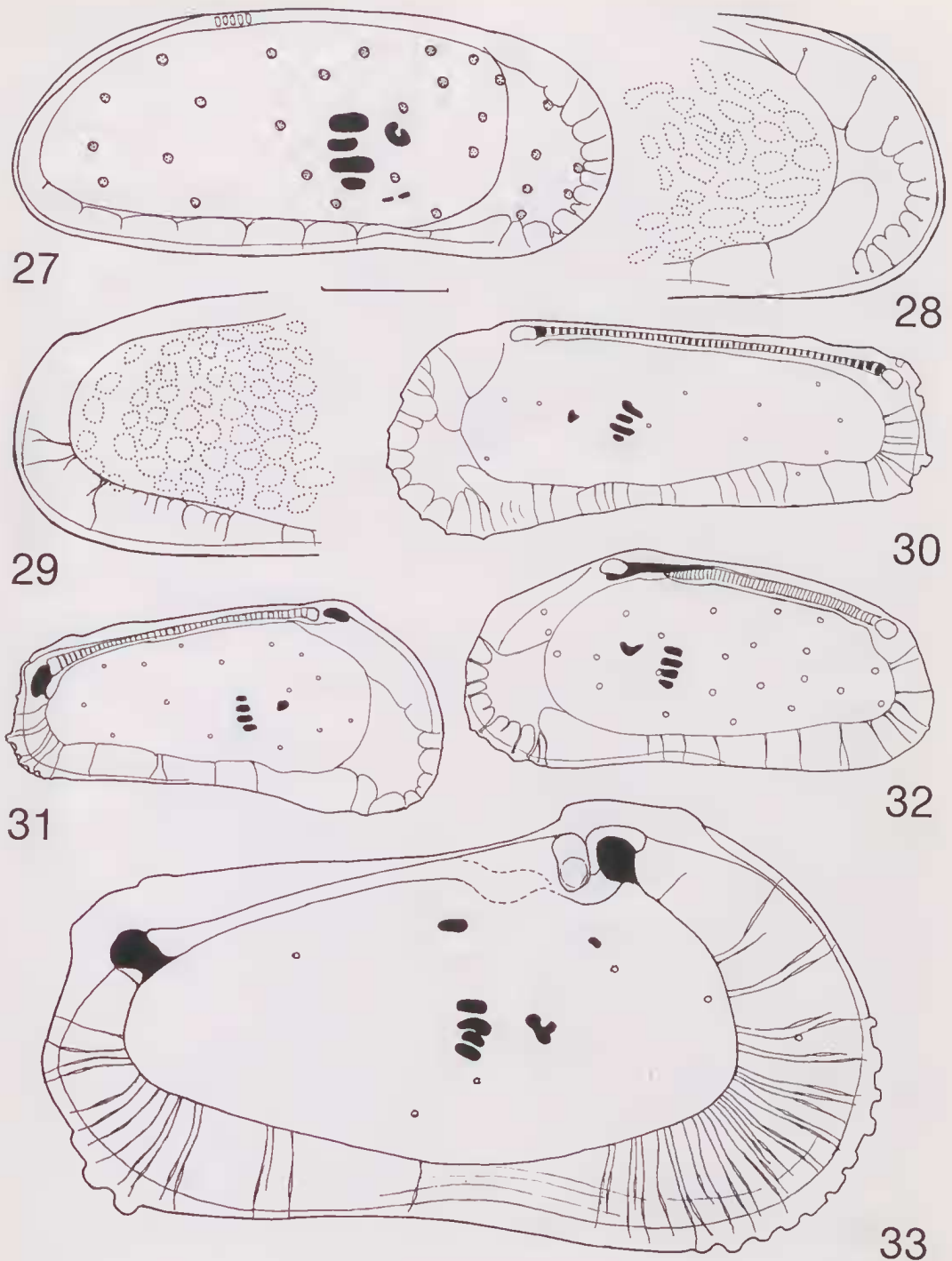
***Phlyctenophora* cf. *zealandica* Brady**

(Figs 47-49)

Phlyctenophora zealandica Brady, 1880:33.

Material. 1 ad. ♀ LV, NTM Cr.005646, PH1; 1 ad. ♂ and 1 ad. ♀ carapaces, 1 ad. ♂ LV, 1 ad. ♂ RV, 1 ad. ♀ LV, 1 ad. ♀ RV, 8 juv. LV, 4 juv. RV, PH1 and PH2, in NTM.

Dimensions. NTM Cr.005646 — L, 0.94; H, 0.45.



Figs 27-33. Camera lucida drawings: 27, *Pseudopsammocythere* cf. *reniformis*, ♀, internal LV; 28, ♀, paratype anterior internal LV; 29, ♀, paratype posterior internal LV; 30, ♂, holotype, internal RV; 31, *Labutisella darwinensis*, ♀, paratype, internal LV; 32, *Mackenzieartia bentleyi*, ♀, paratype, internal RV; 33, *Bradyleberis cristatella*, ♀, internal LV. Scale line 0.1mm.

Paracypridid indet.

(Fig. 25)

Material. Broken ad. RV, NTM Cr.005647, PH1; and 1 juv. carapace, 1 juv. LV, 1 juv. RV, PH1, in NTM.

Dimensions. NTM Cr.005647 — L, 0.70 (estimated), H, 0.27.

Notes. This form probably represents a new paracypridid genus which could be based on the Indonesian species *Paracypris ovalis* Brady. Unfortunately, soft parts (critical for determination of genera in cypridaceans) are not available either in our collection or in the original Brady material at the Hancock Museum, Newcastle-upon-Tyne. Unlike *Paracypris s.s.* which is subacuminate posteriorly, *P. ovalis* is almost equally well rounded posteriorly and anteriorly.

Family Pontocyprididae Mueller**Genus *Propontocypris* Sylvester Bradley*****Propontocypris* cf. *litoricola* Maddocks**

Propontocypris (*Ekpontocypris*) *litoricola* Maddocks, 1969: 27-32.

Material. 1 A-1 ♀ carapace, NTM Cr.005648, HPSB; 2 A-1 ♀ carapaces, 4 juv. carapaces (2 A-2, 2A-3), HPSB, in NTM

Dimensions. NTM Cr.005648 — L, 0.70; H, 0.33; B, 0.27.

Notes. Maddocks (1969) subdivided *Propontocypris* Sylvester Bradley into three subgenera. Her species *litoricola* belongs to the subgenus *Ekpontocypris*. We leave the citation in genus because only A-1 and smaller juveniles were collected.

Further, the subgeneric distinctions are based partly on soft anatomy which does not exist in our material. Another species to which our specimens could be referred is *Propontocypris robusta* (Scott). Possibly, when adults with soft parts are collected, this Hamelin Pool taxon will be described as a new species of *Propontocypris* (*Ekpontocypris*).

***Propontocypris* sp.**

(Figs 5, 50)

Material. 1 ad. ♀, RV, NTM Cr.005649, PH2.

Dimensions. NTM Cr.005649 — L, 0.76; H, 0.36.

Family Paradoxostomatidae Brady and Norman**Genus *Paradoxostoma* Fischer*****Paradoxostoma porthedlandensis* Hartmann**

Paradoxostoma porthedlandensis Hartmann, 1978: 133.

Material. 1 ad. ♀ LV, NTM Cr.005650, HPSB.

Dimensions. NTM Cr.005650 — L, 0.63; H, 0.28.

***Paradoxostoma vespornatum* Hartmann**

Paradoxostoma vespornatum Hartmann, 1978: 134-135.

Material. 1 ad. ♀ carapace, NTM Cr.005651, PH1; 1 ad. ♀ LV, PH1, in NTM.

Dimensions. NTM Cr.005651 — L, 0.56; H, 0.25; B, 0.19.

***Paradoxostoma hoppei* Hartmann,**

Paradoxostoma hoppei Hartmann, 1978: 133-134.

Material. 1 ad. ♀ LV, NTM Cr.005652, PH1; 1 ad. ♀ RV, 1 juv. LV, PH1, in NTM.

Dimensions. NTM Cr.005652 — L, 0.57; H, 0.32.

***Paradoxostoma* sp.**

(Figs 21, 23)

Material. 1 ad. ♀ RV, NTM Cr.005653, PH1.

Dimensions. NTM Cr.005653 — L, 0.635; H, 0.37.

***Paradoxostoma dorsostrata* sp. nov.**

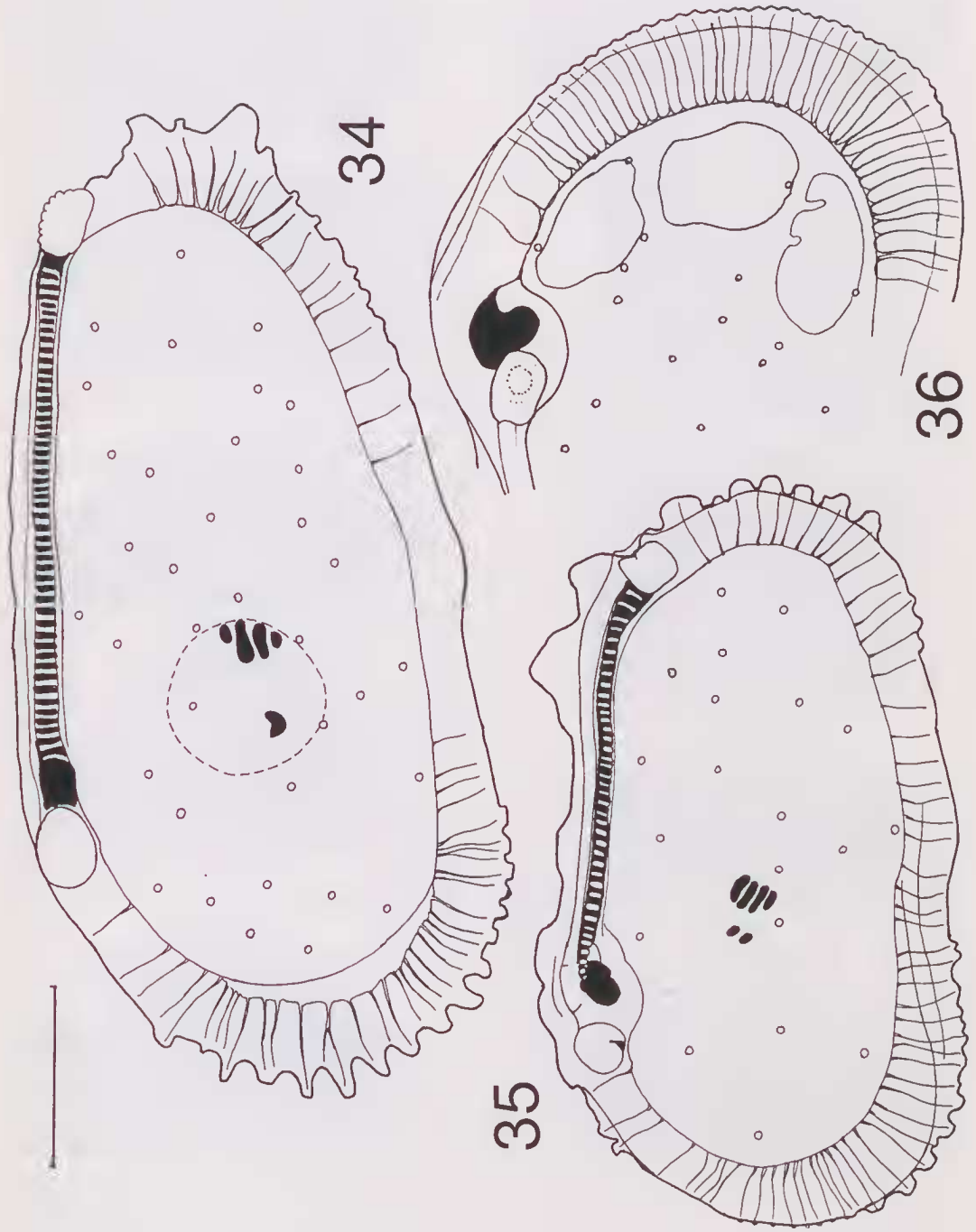
(Fig. 24)

Type material. HOLOTYPE — ad. ♀ carapace, NTM Cr.005654, HPSB. PARATYPE — 1 ad. ♀ LV on assemblage slide, HPSB, in NTM.

Description. Shell rather fragile, small; subelliptical in lateral view; mainly smooth but striate posterodorsally; dorsum gently convex, inflexed posterodorsally; venter sinuated medially; posterior more broadly rounded than the anterior; greatest height behind the middle and half the length; narrowly elliptical in dorsal view. Inner lamellae moderately broad; line of concrescence submarginal, except ventromedially; marginal pore canals numbering about a dozen, very short and straight; normal pore canals scattered, simple; hinge adont; central adductor muscle scar pattern comprises single row of four scars arranged vertically. Sex dimorphism not determined.

Dimensions. Holotype — L, 0.44; H, 0.19; B, 0.13.

Etymology. *dorsa* (L.) = rear; *striata* (L.) = striate.



Figs 34-36. Camera lucida drawings: 34, *Bicornucythere cf. darwini*, ♂, internal RV; 35, *Actinoleberis arafurae*, ♂, paratype, internal RV; 36, *Orionina territoriae*, ♀, paratype, anterior internal LV. Scale line 0.1mm.

Notes. The posterodorsal striations distinguish this taxon from the many new species described in Hartmann (1978). No other species have been described from northern and north-western Australia in this species rich genus.

Genus *Xiphichilus* Brady and Norman
Xiphichilus sp.

(Fig. 26)

Material. 1 ad. ♀ LV, damaged slightly at the posterior, NTM Cr.005655, PH2.

Dimensions. NTM Cr.005655 — L, 0.60; H, 0.23.

Paradoxostomatids indet.

Notes. Additionally, our collections contain several indeterminable paradoxostomatids. A single carapace, possibly a *Paradoxostoma*, occurs in the Hamelin Pool sample (HPSB). The Port Hedland collections have two carapaces and a broken RV. The smaller carapace is possibly a *Paradoxostoma*, the other carapace and broken RV could belong either in *Paracytheroideis* Mueller, 1894 or *Xiphichilus*. These several taxa are stored by locality: Reg. No. NTM Cr.005656 (HPSB); and Reg. No. NTM Cr.005657 (PH).

Genus *Cytheroideis* Mueller
Cytheroideis bentleyi sp. nov.

(Fig. 22)

Type Material. HOLOTYPE — ad. ♂, NTM Cr.005658, DN. PARATYPES — 2 ad. carapaces (1 ♂, 1 ♀) on assemblage slide, DN, in NTM.

Description. Shell small, subelliptical, smooth; dorsum gently convex, venter inflexed anteromedially; anterior rounded, trending anteroventrally; posterior subrounded, trending posterodorsally; narrowly elliptical in dorsal view. Inner lamellae moderately broad, except ventromedially where they are narrower; marginal pore canals few, widely spaced; normal pore canals scattered, simple, open; central adductor scar pattern comprising four subvertical adductors and a broadly V-shaped frontal scar; hinge adont, RV ridge accommodated in LV groove. Sex dimorphism distinct, ♀ higher with respect to length than ♂.

Dimensions. — L, 0.41; H, 0.19; B, 0.13.

Etymology. For Mr C Bentley a colleague in research on Australian marine Ostracoda.

Notes. *Cytheroideis* Mueller is distinguished from other paradoxostomatids by its well developed frontal scar. The common ectoparasitic genera have at best a weakly defined frontal scar because their mandible coxae are developed as acicular styli, adapted to pierce host plant or animal tissues. *Cytheroideis*, on the other hand, has a more normal adducting/abducting and promotor/remotor mandible coxa requiring stronger extrinsic muscles — hence the distinct frontal scar to which two cartilaginous bundles from the coxal fulcrum attach, enabling triturating functions and a free-living habit of life as a fine detritus scavenger.

Family Bythocytheridae Sars

Genus *Rhombobythere* Schornikov
Rhombobythere obesa Schornikov

Rhombobythere obesa Schornikov, 1982:69-70.

Material. 1 ad. ♂ LV (abraded, mollusc predated), NTM Cr.005659, PH1.

Dimensions. NTM Cr. 005659 — L, 0.54; H, 0.32.

Notes. Since bythocytherids normally occur offshore, the presence of this valve in a coastal collection is anomalous. Probably, the living animal was predated and killed in its life habitat; then the valves became disarticulated and abraded and were carried coastwards in a tidal surge (the area has 10m tides) or following storms.

***Rhombobythere alata* Schornikov**

Rhombobythere alata Schornikov, 1982: 67.

Material. 1 ad. ♀ LV, NTM Cr.005660, DN.

Dimensions. NTM Cr.005660 — L, 0.38; H, 0.29.

Genus *Dentibythere* Schornikov

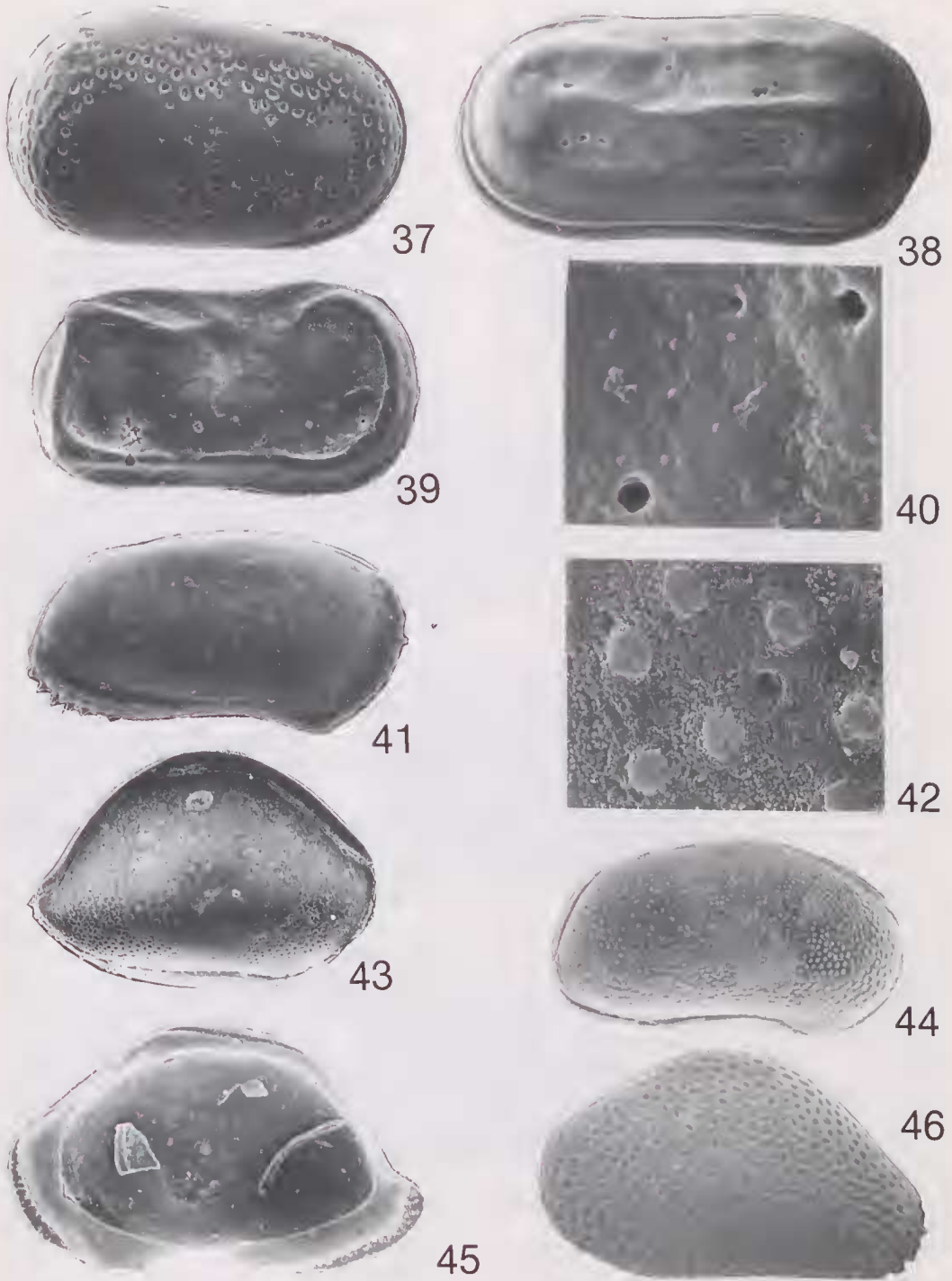
Dentibythere sp.

(Figs 3, 57)

Material. 1 ad. (?) RV, NTM Cr.005661, DN.

Dimensions. NTM Cr.005661 — L, 0.36; H, 0.16.

Notes. This species differs from the type species *D. dentata* Schornikov by its smaller size and the absence of any subrounded posteroventral spine, such as characterises *D. dentata*. Since our specimen is possibly subadult and certainly allochthonous (washed in from offshore) it seems wise to defer description of a new species.



Figs 37-46. SEM micrographs: 37, *Cytherella semitalis*, ♀, external RV, × 200; 38, *Cytherelloidea trilirata*, ♀, paratype, external LV, × 200; 39, 40, *Cytherelloidea darwinensis* — 39, ♂, holotype, external RV, × 215; 40, detail simple normal pore canals, × 5000; 42, *?Orlovibairdia* sp., ? ♀, external RV, × 200; 42, 44, *Papillatabairdia* cf. *dentata* — 42, detail simple normal pore canals, × 2740; 44, ♂, external RV, × 175; 43, 45, *Paranesidea onslowensis* — 43, ♀, external RV, × 145; 45, ♀, internal RV, × 145; 46, *Paranesidea parva*, ♀, external LV, × 200.

Family Cytheromatidae Elofson

Genus *Paracytheroma* Juday*Paracytheroma mangrovicola* (Hartmann)
comb. nov.
(Figs 2, 58)*Cytheroma mangrovicola* Hartmann, 1978:81.**Material.** 1 ad. ♀ RV, NTM Cr.005662, HPSB; 1 ad. ♀ RV, 1 ad. ♂ RV, 1 ad. ♂ LV, 1 ad. ♀ LV, 1 juv. LV, HPSB, in NTM.**Dimensions.** NTM Cr.005662 — L, 0.48; H, 0.23.**Notes.** The type genus in this family, *Cytheroma* Mueller is characterised by a prominent Genitalhocker (genital protuberance) in the ♀ (Mueller 1894: Pl. 26, Fig. 13; Elofson 1939: Fig. 37). This feature does not occur in *Paracytheroma* nor is it present in Hartmann's species (Hartmann 1978: Fig. 136). Species DG of Maddocks (1966: Fig. 33.1) is very similar in shape to *P. mangrovicola*.*Paracytheroma hamelinensis* sp. nov.

(Fig. 1)

Type material. HOLOTYPE — 1 ad. ♀ RV, NTM Cr. 005663, HPSB. PARATYPES — 25 on assemblage slide, HPSB, in NTM.**Description.** Shell medium sized, elongate subovate, smooth; height about half the length; dorsum regularly convex; venter nearly straight; anterior and posterior broadly rounded; regularly elliptical in dorsal view. Inner lamellae broad, except medioventrally, with large anterior and posterior vestibules; marginal pore canals short, often branched near their bases; normal pore canals simple, open, rimmed; hinge adont, RV ridge and LV groove; central muscle scars comprise four adductors in a subvertical row, plus a broadly v-shaped frontal scar and two mandibulars. Sex dimorphism distinct, ♂ more elongate than ♀.**Dimensions.** Holotype — L, 0.54; H, 0.25.**Etymology.** From the type locality.**Notes.** Similar to *P. mangrovicola* but distinctly longer and not as inflexed ventromedially; the marginal pore canal pattern also differs.Genus *Javanella* Kingma*Javanella caudata* (Hartmann) comb. nov.
Paracytheroma caudata Hartmann, 1978:82.**Material.** 1 ad. ♀, NTM Cr.005664, DN; 1 ad. ♀ carapace, PH1, in NTM; 6 carapaces, 2 LV (different growth stages), 1 RV mostly ♀, DN, in NTM.**Dimensions.** NTM Cr.005664 — L, 0.53; H, 0.25; B, 0.21.**Notes.** *Javanella*, which is sometimes synonymised with *Pellucistoma* Coryell and Fields, a Central American genus, is characterised by well developed terminal hinge elements unlike *Cytheroma* and *Paracytheroma*. Hartmann's species *caudata* (originally described in *Paracytheroma*) is less elongate than the Late Pliocene type species *J. kendengensis* Kingma from Java, Indonesia.Until a ♂ is described for *Pellucistoma*, Sandberg (1969) having described the appendages of a ♀ only, we prefer to retain *Pellucistoma* and *Javanella* as distinct, although closely related, genera. Known soft part differences include asymmetry in the right and left fifth and sixth antennular segments in *Pellucistoma* (in neither case is the combination like *Javanella*) and a distinctive long ventrodorsal bristle on the first antennal endopod segment. The tip of this bristle is bulbous in *Pellucistoma* but not in *Javanella*.*Javanella arenicola* (Hartmann) comb. nov.
Paracytheroma arenicola Hartmann, 1978:83.**Material.** 1 ad. ♂ carapace, NTM Cr.005665, PH2.**Dimensions.** NTM Cr.005665 — L, 0.42; H, 0.21; B, 0.17.**Notes.** Originally placed by Hartmann in *Paracytheroma*, this species shows the well developed terminal hinge elements and general appearance of a *Javanella*. It is somewhat smaller than *J. kendengensis* and *J. caudata*.

Family Cytheridae Baird

Genus *Neomonoceratina* Kingma*Neomonoceratina microreticulata* Kingma
(Fig. 59)*Neomonoceratina microreticulata* Kingma, 1948:96.**Material.** 1 ad. ♀ carapace, NTM Cr.005666, DN; 1 ad. ♀ carapace, 1 ad. ♂ carapace, DN, in NTM.**Dimensions.** NTM Cr.005666 — L, 0.43; H, 0.24; B, 0.22.*Neomonoceratina porocostata* sp. nov.
(Figs 60, 61)



Figs 47-56. SEM micrographs: **47-49**, *Phlyctenophora cf. zealandica* — **47**, ♀, internal RV, × 130; **48**, ♀, external RV, × 130; **49**, detail central adductor muscle scars, × 1570; **50**, *Propontocypris* sp., ♀, external RV, × 200; **51**, **52**, *Xestoleberis darwinensis* — **51**, ♀, paratype, dorsal view, × 200; **52**, ♂, holotype, external RV, × 200; **53**, *Eupolycope occidensnuda*, holotype, external LV, × 200; **54**, *Paracypris occidenslevis*, ♂, holotype, external RV, × 200; **55**, *Microcythere* sp., ♀, external LV, × 200; **56**, *Microcythere logani*, ♂, holotype, external LV, × 200.

Type material. HOLOTYPE — 1 ad ♂ carapace, NTM Cr.005792, DN. PARATYPE — 1 ad. ♀ carapace, NTM Cr.005667, DN; ca 80 on assemblage slide, DN in NTM.

Additional material. 14 carapaces, 5 RV, 8 LV, including both sexes, mostly ad., PH1 and PH2, in NTM.

Description. Carapace small, subquadrate in lateral view with well defined posterodorsal cauda; surface punctate (more coarsely so in the ♀ than in the ♂), and also traversed by several narrow ribs, the two uppermost are interrupted by a marked dorsomedial sulcus, while the median and the ventral rib are continuous; dorsal margin nearly straight; ventral margin convex tapering posteriorly to cauda; anterior broadly rounded; subhastate in dorsal view. Inner lamellae moderately broad, with small anterior and posterior vestibules; marginal pore canals few anteriorly (where they cluster anteroventrally) and posteriorly, several also occur posteroventrally; normal pore canals sieve type; hinge schizodont; muscle scar pattern comprising subvertical series of four central adductors, plus frontal scar, two small mandibulars and several dorsal scars. Sex dimorphism marked: ♀ shorter than ♂ which also has finer punctae, as noted above.

Dimensions. Holotype — L, 0.45; H, 0.20; B, 0.18; NTM Cr.005667 — L, 0.42; H, 0.225; B, 0.185.

Etymology. *poros* (Gk) = hole; *costata* (L.) = ribbed.

Notes. The new species is close to *N. macropora* Kingma and *N. mediterranea* Ruggieri. It differs from the first in lacking a posteroventral spine (which protrudes clearly in dorsal view for *macropora*) and in the finer male punctations. *N. mediterranea*, on the other hand, has more numerous fine pores than our new species and, according to Ruggieri (1953: 4-7) has no appreciable sex dimorphism. Previous Australian records of *N. mediterranea* based on few specimens (McKenzie and Pickett 1984) are probably synonymous with our new species.

Genus *Jankeijcythere* McKenzie

Jankeijcythere cf. *koenigswaldi* (Keij)

Neomonoceratina koenigswaldi Keij, 1954:359.

Neomonoceratina koenigswaldi — Hartmann 1978:76; Hartmann 1981:101.

'Neomonoceratina' koenigswaldi — McKenzie and Pickett 1984:229.

Jankeijcythere koenigswaldi — McKenzie 1988: 33.

Material. 1 ad. ♀ LV, NTM Cr.005668 PH1; 1 ad. ♂ LV, 3 juv. LV (2 growth stages), 2 juv. RV (2 growth stages), PH1, in NTM.

Dimensions. NTM Cr.005668 — L, 0.70; H, 0.38.

Genus *Microcytherura* Mueller *Microcytherura rugosella* sp. nov.

(Fig. 65)

Type material. HOLOTYPE — 1 ad. ♂ carapace, NTM Cr.005669, DN. PARATYPE — 1 ad. ♀ carapace, NTM Cr.005799, DN. Other PARATYPES — 10 on assemblage slide, DN, in NTM.

Additional material. 1 ad. ♂ LV, RV, 1 ad. ♀ RV, PH2, in NTM.

Description. Carapace small; elongate subovate to subtrapezoidal; surface ornamented by transverse wrinkles and intervening pits; dorsum straight; venter nearly so; anterior more broadly rounded than the posterior; height less than half the length; sub-elliptical with rounded termini in dorsal view. Inner lamellae relatively narrow; with distinct anterior and posterior vestibules; marginal pore canals short, widely spaced, few in number; normal pore canals sieve type, scattered; hinge merodont, erenulate toothlets of RV accommodated in LV; muscle scars comprising four adductors in a subvertical series plus a frontal scar and two mandibulars. Sex dimorphism distinct, ♂ longer than ♀ and relatively less high.

Dimensions. Holotype — L, 0.31; H, 0.14; B, 0.15; NTM Cr.005799 — L, 0.29; H, 0.14; B, 0.16.

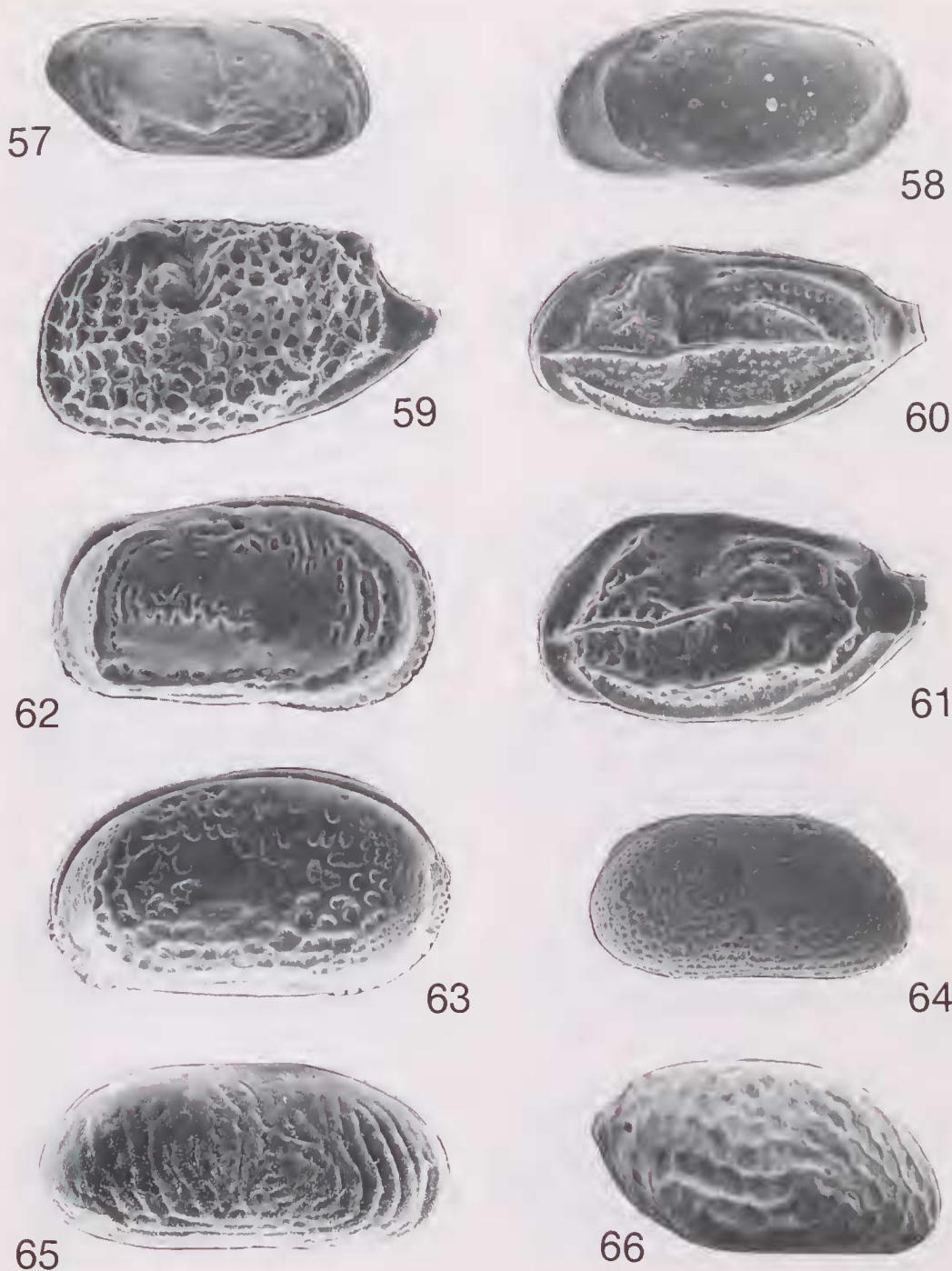
Etymology. *rugosus* (L.) = wrinkled.

Notes. Of the several Australian species referable to *Microcytherura*, viz. *M. hornibrooki*, *M. australis*, *M. gawemuelleri*, *M. triebeli* (McKenzie 1967), *M. difficilis* (McKenzie), *M. cedunaensis*, *M. aestuaricola* (Hartmann 1980) none has the transverse wrinkling that characterises the ornament of our new species.

Microcytherura punctatella sp. nov.

(Fig. 64)

Type material. HOLOTYPE — 1 ad. ♂ carapace, NTM Cr.005670, PH1. PARATYPES — 1 ad. ♀ LV, NTM



Figs 57-66. SEM micrographs: **57**, *Dentibithere* sp., A-1 juvenile, external RV, $\times 200$; **58**, *Paracytheroma mangrovicola*, ♀, internal RV, $\times 195$; **59**, *Neomonoceratina microreticulata*, ♀, external LV, $\times 265$; **60**, **61**, *Neomonoceratina porocostata* — **60**, ♂, holotype, external LV, $\times 245$; **61**, ♀, paratype, external LV, $\times 265$; **62**, **63**, *Bishopina spinulosa* — **62**, ♂, external RV, $\times 235$; **63**, ♀, external LV, $\times 180$; **64**, *Microcytherura punctatella*, ♀, paratype, external RV, $\times 220$; **65**, *Microcytherura rugosella*, ♂, holotype, external RV, $\times 400$; **66**, *Microcytherura* sp., ♀, external RV, $\times 200$.

Cr.005671, PH1; — 1 ad ♂ LV on assemblage slide, PH1, in NTM; 1 ad. ♀ carapace was lost following SEM examination.

Diagnosis. Carapace small, elongate subtrapezoidal; entire surface punctate, with the muri between the punctae resembling a surface reticulation; other details as for *M. rugosella* sp. nov. (above). Sex dimorphism rather weak. ♀ somewhat shorter than ♂.

Dimensions. Holotype — L, 0.41; H, 0.21; B, 0.23. NTM Cr.005671 — L, 0.39; H, 0.22.

Etymology. *punctatella* (L.) — prettily punctate.

Notes. This species lies between *M. cedunaensis* and *M. aestuaricola*, being less finely punctate than the former and less broadly reticulate than the latter.

Microcytherura sp.

(Fig. 66)

Material. 1 ad. ♀ RV, NTM Cr.005672, PH1; 3 LV, 3 RV (mostly juv., showing effects of abrasion), PH1 and PH2, in NTM.

Dimensions. NTM Cr.005672 — L, 0.38; H, 0.22.

Notes. This species has some characteristics of *M. crassa* (Hornibrook) from New Zealand but is much smaller. It appears to be an allochthonous element in the Port Hedland assemblages.

Family Cytherideidae Sylvester Bradley and Harding

Genus *Bishopina* Bonaduce, Masoli and Pugliese

Bishopina spinulosa (Brady)

(Figs 62, 63)

Cytheridea spinulosa Brady, 1868:182; Brady 1880:112.

Clithrocytheridea spinulosa — Keij 1954:342.

Miocyprideis spinulosa — Kollmann 1960:178

Bishopina spinulosa — Wouters 1981:5.

Material. 1 ad. ♂ carapace, NTM Cr.005673, DN; 1 ad. ♀ carapace, NTM Cr.005674, DN; 2 ad. ♂ carapaces, DN, in NTM.

Dimensions. NTM Cr.005673 — L, 0.49; H, 0.26; B, 0.23. NTM Cr.005674 — L, 0.65; H, 0.36; B, 0.33.

Notes. The Darwin specimens have been compared against Brady's types in the collections of the Hancock Museum, Newcastle-upon-Tyne, and seem conspecific. The species was originally described from

Mauritius but its recorded range extends to Fiji and the Philippines (Keij 1954: 352). Of the other Indopacific *Bishopina* species, *B. mozarti* Bonaduce, Masoli and Pugliese is less pitted over its surface than *B. spinulosa* as is *B. tinorensis* (Fyan). *B. atjehensis* (Kingma) is pitted more uniformly than *B. spinulosa* (examination of types from the Kingma collection in the Geological and Mining Museum, University of Utrecht, Reg. No. D31928). Finally, *B. vangoethemi* Wouters is pitted all over its surface like *B. spinulosa* but the pitting is elongate and there is no finer posterior and anterior punctation as occurs in Brady's species.

We follow Wouters (1981) in his discussion sustaining the validity of *Bishopina*, which has been synonymised by others with *Miocyprideis* Kollmann and, more recently with *Neocyprideis* Apostolescu. Further, no previous authorities (including Wouters 1981) have remarked on the very striking sex dimorphism of *Bishopina*. Consequently, since their illustrations have been of only ♀ (Kingma 1948; Keij 1954; Wouters 1981) or else of ♂ only (Fyan 1916; Bonaduce *et al* 1976) some confusion has arisen over its generic validity. Neither *Miocyprideis* nor *Neocyprideis* show such strong sex dimorphism, which in the case of *Bishopina* includes marked variations in size and shape as well as ornament between ♂ and ♀ (cf. Figs 62, 63).

Family Xestoleberididae Sars

Genus *Xestoleberis* Sars

Xestoleberis broouensis Hartmann

Xestoleberis broouensis Hartmann, 1978: 117-118.

Material. 1 ad. ♀ carapace, NTM Cr.005675, PH1; and ca 45 (carapaces, LV, RV) including ad. of both sexes and several growth stages, PH1 and PH2, in NTM.

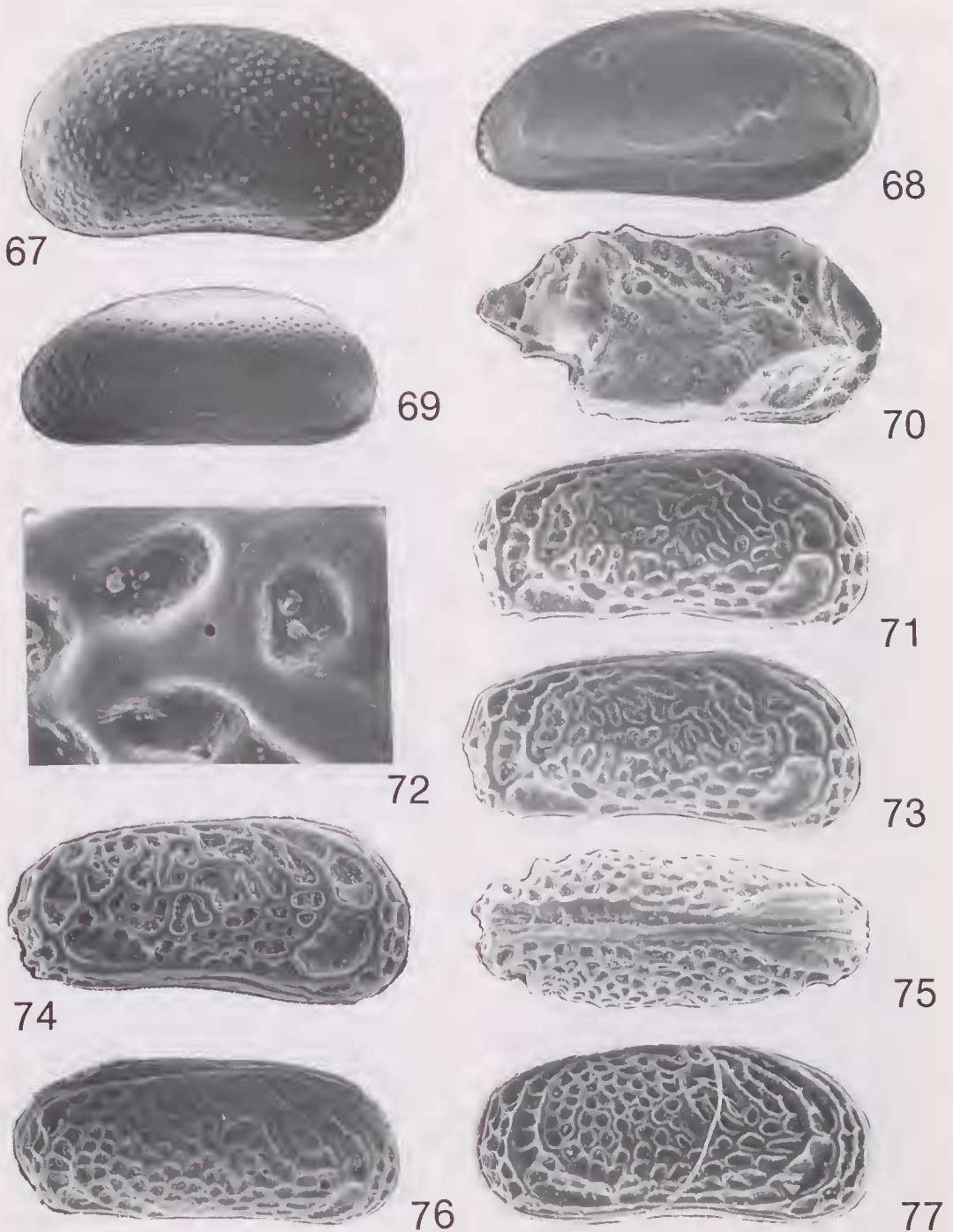
Dimensions. NTM Cr.005675 — L, 0.66; H, 0.37.

Xestoleberis porthedlandensis Hartmann

Xestoleberis porthedlandensis Hartmann, 1978: 118-119.

Material. 1 ad. ♀ carapace, NTM Cr.005676, PH1; ca 40 (carapaces, LV, RV) including ad. of both sexes and several growth stages, PH1 and PH2, in NTM.

Dimensions. NTM Cr.005676 — L, 0.52; H, 0.32; B, 0.29



Figs 67-77. SEM micrographs: **67,68**, *Hedlandella gesae* — **67**, ♀, paratype, external RV, × 200; **68**, ♀, paratype, oblique internal RV, × 200; **69**, *Hedlandella parva*, ♂, holotype, external LV, × 200; **70**, *Paracytheridea remanei*, ♀ external RV, × 210; **71-73**, *Keijia foveata* — **71**, ♂, external RV, × 235; **72**, detail simple normal pore canal, × 1680; **73**, ♀, external RV, × 245; **74**, *Keijia nordaustraliae*, ♀, paratype, external RV, × 245; **75-77**, *Parakeijia territoriae* — **75**, ♂, paratype, dorsal view (anterior to right), × 240; **76**, ♂, paratype, slightly oblique RV, 225; **77**, ♀, holotype, external RV, × 245.

***Xestoleberis cauticola* Hartmann**

Xestoleberis cauticola Hartmann, 1978: 119-120.

Material. 1 ad. ♀ carapace, NTM Cr.005677, PH1; ca 35 (carapaces, LV, RV) including both sexes and several growth stages, PH1 and PH2. in NTM.

Dimensions. NTM Cr.005677 — L, 0.54; H, 0.37; B, 0.35.

***Xestoleberis* cf. *exmouthensis* Hartmann**

(Fig. 16)

Xestoleberis exmouthensis Hartmann, 1978: 121-122.

Material. 1 ad. ♀ carapace, NTM Cr.005678, HPSB; ca 25 (carapaces, LV, RV) including adults of both sexes and several growth stages, HPSB, in NTM.

Dimensions. NTM Cr.005678 — L, 0.62; H, 0.37; B, 0.31.

Xestoleberis paraporthedlandensis

Hartmann

Xestoleberis paraporthedlandensis Hartmann, 1978: 122-123.

Material. 1 ad. ♀ carapace, HPSB; 1 ad. ♀ RV, HPSB, in NTM.

Dimensions. NTM Cr.005679 — L, 0.54; H, 0.33; B, 0.28.

***Xestoleberis* cf. *dougiamasorum* Hartmann**

(Fig. 6)

Xestoleberis dougiamasorum Hartmann, 1978: 126-127.

Material. 1 ad. ♀ carapace, NTM Cr.005680, HPSB; 5 (carapaces, 2 LV, 9 RV) including ad. of both sexes and several growth stages, HPSB, in NTM.

Dimensions. NTM Cr.005680 — L, 0.48; H, 0.275; B, 0.32.

Notes. Unfortunately, of the two LVs in our material only one is adult making comparison with Hartmann's species more difficult (he only illustrated the LV profile). Nevertheless, the ventral marginal areas including the pore canal pattern seem close to *X. dougiamasorum*. The size of our hypotype ♀ is somewhat less than that recorded by Hartmann for the species. His cited range was 0.50—0.56mm for the length of mature ♀ (Hartmann 1978: 127).

***Xestoleberis* cf. *portaugustensis* Hartmann**

(Fig. 10)

Xestoleberis portaugustensis Hartmann, 1980: 152-153.

Material. 1 ad. ♀ carapace, NTM Cr.005681, HPSB; 24 (carapaces, LVs, RVs) including ad. of both sexes and several growth stages, HPSB, in NTM.

Dimensions. NTM Cr.005681 — L, 0.42; H, 0.30; B, 0.29.

Notes. Since several growth stages occur in the material this is clearly an autoecithonous species. The taxon is characterised by a greater height: length ratio than any other xestoleberid in our collections and by a distinctive anteroventral LV overlap. This record is considerably removed from the type locality at Port Augusta, South Australia.

***Xestoleberis paramargaritea* sp. nov.**

(Fig. 11)

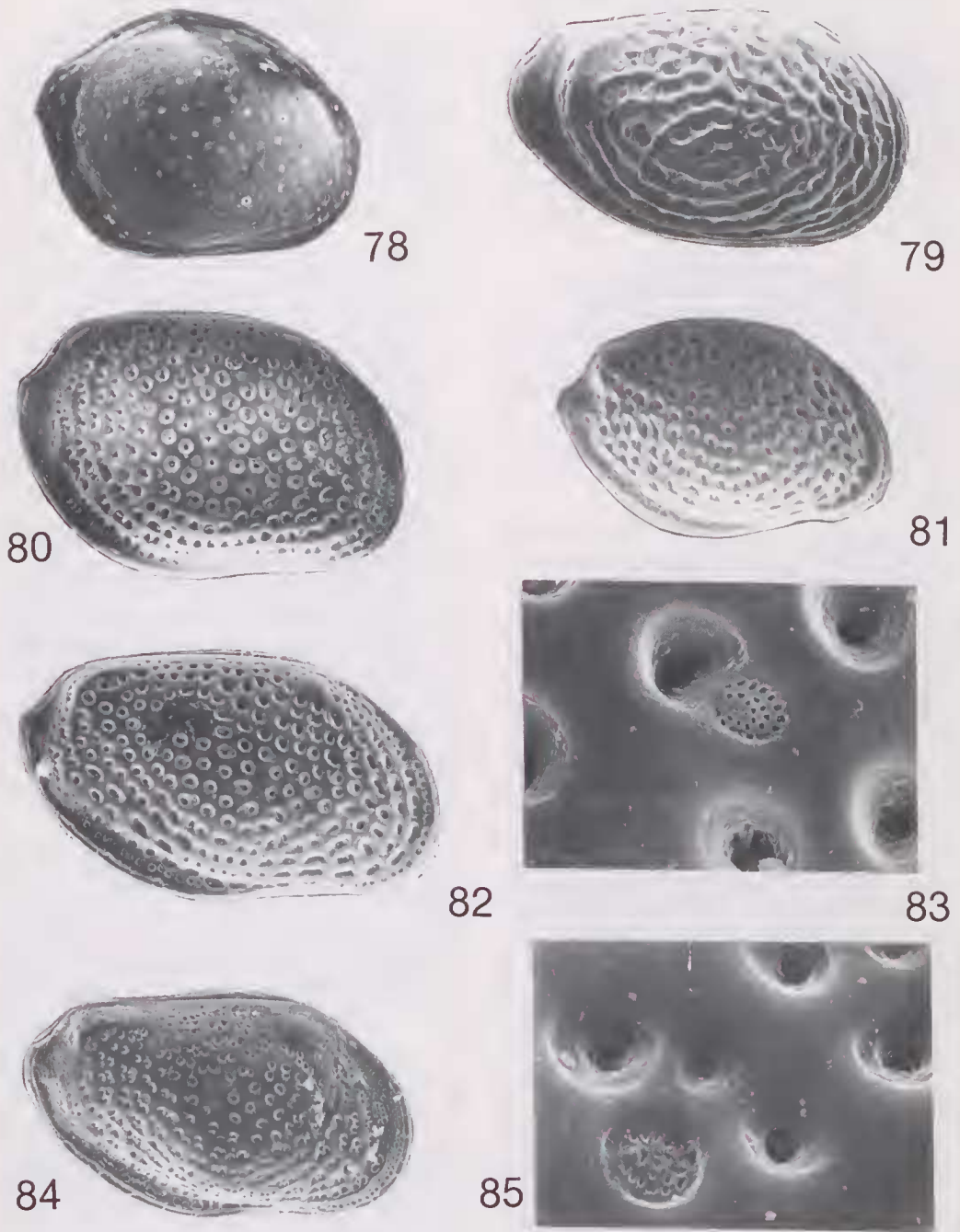
Type material. HOLOTYPE — 1 ad. ♀ carapace, NTM Cr.005682, DN. PARATYPES — 1 ad. ♀ LV, NTM Cr.005683, DN; 14 carapaces, 1 RV, 1 LV all ad. (except for one juv. carapace), including 9 ♀ carapaces, 4 ♂ carapaces, 2 ♀ valves, DN, in NTM.

Description. Carapace medium sized; subglobose; surface smooth and lacking patch pattern; LV overlapping RV dorsally; dorsum weakly convex, sloping posteriorly; venter inflexed anteromedially; anterior rounded, trending anteroventrally; posterior broadly rounded, most inflated posterodorsally; in dorsal view, ovate; greatest breadth behind middle and narrowing in front; height about 70% of the length, greatest height posteromedial. Inner lamellae moderately wide, large anterior and posterior vestibules; marginal pore canals numerous, often clumped anteriorly into groups of two, three or more but not posteriorly; normal pore canals sieve type, numerous, large but not as conspicuous as in *X. darwinensis* sp. nov. (cf. below); 'eye' scar elongate; hinge strong, typically merodont; central muscle scars large (typical for xestoleberidids), comprising four adductors in subvertical series, plus v-shaped frontal scar and two widely separated mandibulars (one obscured in the illustrated specimen). Sex dimorphism distinct, ♀ larger than ♂.

Dimensions. Holotype — L, 0.43; H, 0.29; B, 0.25. NTM Cr.005683 — L, 0.45, H, 0.32.

Etymology. *para* (L.) = like; *margaritea*, a previously described species of *Xestoleberis*.

Notes. The only species which resembles this taxon is *X. margaritea* (Brady) described



Figs 78-85. SEM micrographs: **78**, *Loxoconchella pulchra*, ♀, external RV, × 165; **79**, *Loxoconcha judithae*, ♀, paratype, external RV, × 220; **80, 82, 83**, *Loxoconcha broomensis* — **80**, gerontic ♀, external RV, × 195; **82**, ♂, external RV, × 220; **83**, detail sieve-type normal pore canal, × 1950; **81**, *Loxoconcha minyaustralis*, ♀, holotype, external RV, × 200; **84, 85** *Loxoconcha georgei* — **84**, ♂, external RV, × 210; **85**, detail sieve-type normal pore canal, × 2250.

from the Mediterranean and recorded from Booby Island in the "Challenger" Report (Brady 1880). Mueller (1912) made it clear that the Booby Island record was specifically distinct and assigned this taxon tentatively to *X. intermedia*. Brady (Mueller 1912:303). However, *X. intermedia*, another Mediterranean species described from the coast of Sicily, is more elongate than *X. paramargaritea*.

Xestoleberis darwinensis sp. nov.

(Figs 15, 51, 52)

Type material. HOLOTYPE — 1 ad. ♂ carapace, NTM Cr.005684, DN. PARATYPES — 1 ad. ♀ carapace, NTM Cr.005685, DN; 56 carapaces, 2 RV, 5 LV of which 1 RV and 4 LV represent juv., the remainder (20 ♂, 38 ♀) being ad., DN, in NTM.

Description. Carapace small-medium sized; subovate; surface smooth lacking a patch pattern; dorsum having distinct backwards slope; venter inflexed anteromedially; anterior rounded, narrowing anteroventrally; posterior broadly rounded especially posteroventrally; LV overlapping RV with distinctively bowshaped dorsal margin; height well over half length; ovate in dorsal view; broadest behind middle and narrowing anteriorly, with slight LV overlap in front.

Inner lamellae moderately wide, with distinctive anterior vestibule (cf. Fig. 15) and narrow, elongate posterior vestibule; marginal pore canals numerous, clumped anteriorly in several groups of five or more but only occasionally in the posterior; normal pore canals numerous, large, sieve type and prominent; 'eye' scar distinct; hinge strong, typically microdont; muscle scars similar to *X. paramargaritea* except that the frontal scar is somewhat different, two dorsal scars clearly visible above the central adductors. Sex dimorphism distinct, ♀ larger than ♂.

Dimensions. Holotype — L, 0.39; H, 0.25; B, 0.23. NTM Cr.005685 — L, 0.41; H, 0.27; B, 0.25.

Etymology. Darwin, the type locality.

Notes. The species is close to *X. broomensis* Hartmann but differs in the marginal pore canal pattern both anteriorly and posteriorly; it is further distinguished by its prominent sieve pores - probably an effect of a thicker shell for each adult valve than in *X. paramargaritea* or *X. broomensis*.

Genus Foveoleberis Malz

Foveoleberis foveolata (Brady)

Xestoleberis foveolata Brady, 1880:130.

Uroleberis foveolata — Triebel 1958:111.

Foveoleberis foveolata — Malz 1980:414.

Material. 1 juv. (A-2) RV, NTM Cr.005686, DN; 1 RV, 1 LV, both A-2 juv., DN, in NTM.

Dimensions. NTM Cr.005686 — L, 0.40; H, 0.20.

Notes. These specimens are allochthonous.

Genus Microxestoleberis Mueller

Microxestoleberis hamelini sp. nov.

(Figs 9, 159)

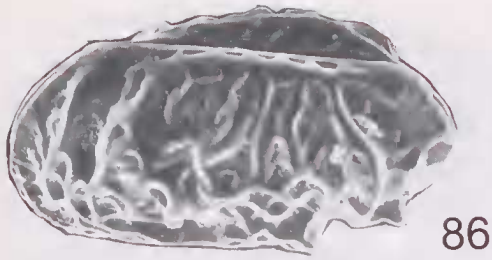
Type material. HOLOTYPE — 1 ad. ♀ carapace, NTM Cr.005687, HPSB. PARATYPES — 1 ad. ♂ LV, NTM Cr.005688, HPSB; 14 (1 carapace, plus LV, RV) including ad. of both sexes and several growth stages, HPSB, in NTM.

Description. Shell arcuate in lateral view and strongly flattened ventrally; broadened in dorsal view with weakly mucronate anterior and very weakly caudate posterior; LV overlapping RV; surface apparently smooth under ordinary light but exhibiting distinctive polygonal reticulation in the SEM (Fig. 159); dorsum regularly arched, venter flattened with straight to flexuous ventral margin; height about half length in ♀ but only 40% length in ♂; sex dimorphism, therefore, is marked and is further accentuated by the occurrence of an internal 'eye' scar in ♀ that is lacking in ♂ (see also Mueller 1894, pl. 39, compare the ♂ in Fig. 1 with the ♀ in Fig. 7). Inner lamellae moderately developed and characteristically displaced, outwards in the ventral region but inwards posteriorly, possibly with small anterior vestibule; marginal pore canals few; normal pore canals sieve type; hinge adont, RV dorsal edge accommodated by LV groove; muscle scar pattern comprising four adductors, broadly v-shaped frontal scar, mandibular scars at best indistinct but likely to be present. Selvage distinct, displaced inwards in the posterior of each valve.

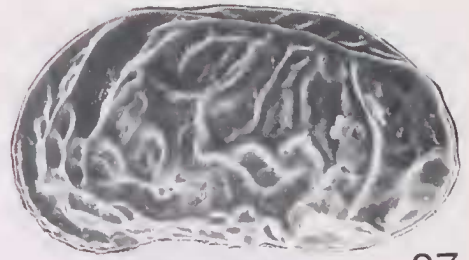
Dimensions. Holotype — L, 0.44; H, 0.22; B, 0.24. NTM Cr.005688 — L, 0.48; H, 0.19.

Etymology. From the type locality.

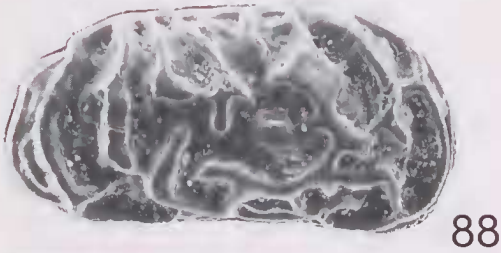
Notes. The ectoparasitic symbiont genus *Aspidoconcha* De Vos is very like *Microxestoleberis* but lacks a cauda and has internal



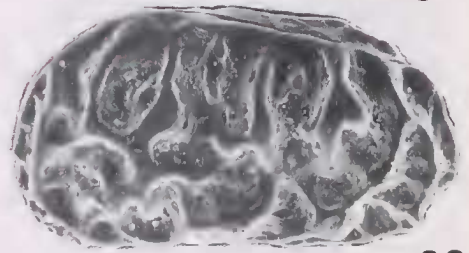
86



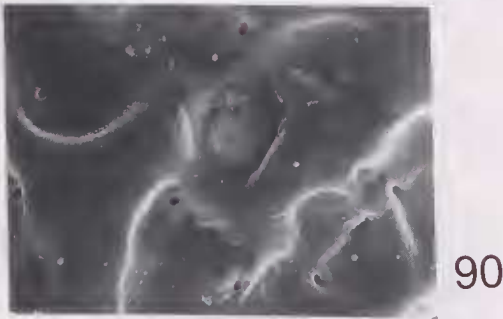
87



88



89



90



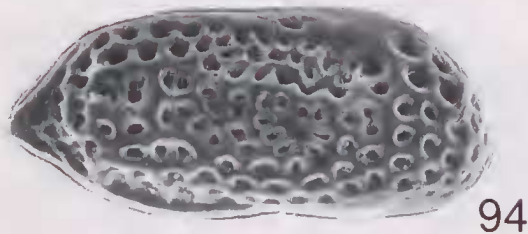
91



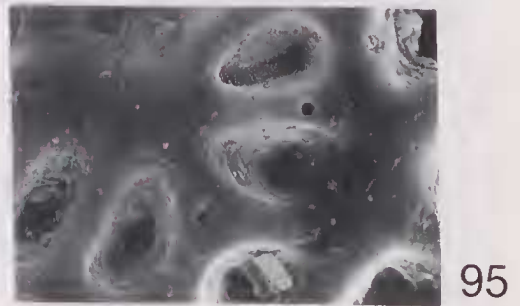
93



92



94



95

Figs 86-95. SEM micrographs: 86, 87, *Callistocythere* cf. *insolita* — 86, ♀, oblique external LV, × 240; 87, ♀, external LV, × 240; 88, *Callistocythere neili*, ♂, holotype, external RV, × 245; 89, *Callistocythere warnei*, ♂, holotype, external LV, × 285; 90, 91, *Callistocythere keiji* — 90, detail simple normal pore canals, × 780; 91, ♂, external RV, × 260; 92, *Leptocythere* cf. *lacustris*, A-1 juvenile, external RV, × 200; 93, *Tanella gracilis darwini*, ♀, holotype, external LV, × 255; 94, 95, *Gambiella pyta* — 94, ♀, holotype, external RV, × 295; 95, detail of simple normal pore canal, × 1780.

'eye' scars in ♂ as well as ♀ (McKenzie 1982: Pl. 1, Figs 1.3). Our record, the first description of a *Microxestoleberis* species from Australia, probably represents a nearshore population whereas the type species, *M. nana* Mueller, 1894, was collected living at 60m depth in the Bay of Naples (Mueller 1894).

Genus *Hedlandella* McKenzie, gen. nov.

Type species *Hedlandella gesae* sp. nov.

Diagnosis. Carapace small, bean shaped in lateral view; subovate in dorsal view; surface conspicuously micropunctate and microspinose; selvage submarginal and distinct; inner lamellae moderately broad, with narrow anterior vestibules; marginal pore canals straight or wavy, some branched, numbering about 25 anteriorly; normal pore canals sieve type; central muscle scars comprising four adductors in a subvertical series, a broadly v-shaped frontal scar, and two small mandibulars; hingement antimerodont. Anterodorsally on the inner surface of each valve is a prominent elongate 'eye' scar (also visible externally through the translucent shell material). Soft anatomy not yet known. Presumed ♀ more swollen posteriorly than presumed ♂.

Etymology. From the type locality.

Notes. The internal 'eye' scar places *Hedlandella* in Xestoleberididae, the only cytheracean family to exhibit this character. No other xestoleberidid genus has microspinose surface ornament and a bean shaped carapace is uncommon in the family. Until recently, xestoleberidids were regarded as typically smooth shelled but now several other ornamented genera are known (*Uroleberis* Triebel, 1958, *Ornatoleberis* Keij, 1975, *Foveoleberis* Malz, 1980) although these are punctate or fossate or reticulate or nodose rather than microspinose, and higher with respect to their length than *Hedlandella*. The antimerodont hinge of *Hedlandella* is not as strongly developed as in other xestoleberidids and its marginal pore canals show a different pattern — since other xestoleberidids have large anterior vestibules their marginal pore canals are rather short anteriorly. Nevertheless, some *Xestoleberis* Sars, 1866 (type genus of the family) species are bean shaped and most have a similar shaped posterior to *Hedlandella*.

***Hedlandella gesae* sp. nov.**

(Figs 12, 67, 68)

Type material. HOLOTYPE, — 1 ad. ♂ carapace, NTM Cr.005689, PH1. PARATYPES — 1 ad. ♀ RV, NTM Cr.005690, PH1; 1 juv. carapace, 3 ad. LV, 2 ad. RV (including both sexes); PH1, in NTM.

Description. As for the generic diagnosis above. Further, this species is distinguished by the presence of several rounded tubercles posteroventrally, each of them considerably larger than any of the ubiquitous spinules which characterise this genus.

Dimensions. Holotype — L, 0.41; H, 0.20; B, 0.23. NTM Cr.005698 — L, 0.445; H, 0.23.

Etymology. For Dr Gesa Hartmann Schröder the polychaete specialist who has contributed substantially to understanding of the Australasian fauna; wife of Prof. Dr Gerd Hartmann, an ostracodologist colleague.

***Hedlandella parva* sp. nov.**

(Fig. 69)

Type material. HOLOTYPE, — 1 ad. ♂ carapace, NTM Cr.005691, PH2. PARATYPES 1 ad. ♂, 3 ad. ♀ carapaces on assemblage slides, PH2 and PH2, in NTM.

Description. Carapace smaller than *H. gesae*; surface micropunctate and weakly microspinose, without any large posteroventral tubercles; the ornament tends to align concentrically, especially in the anterior and ventral regions. Other characters as for *H. gesae*.

Dimensions. Holotype — L, 0.365; H, 0.18; B, 0.18.

Etymology. *parva* (L.) = small.

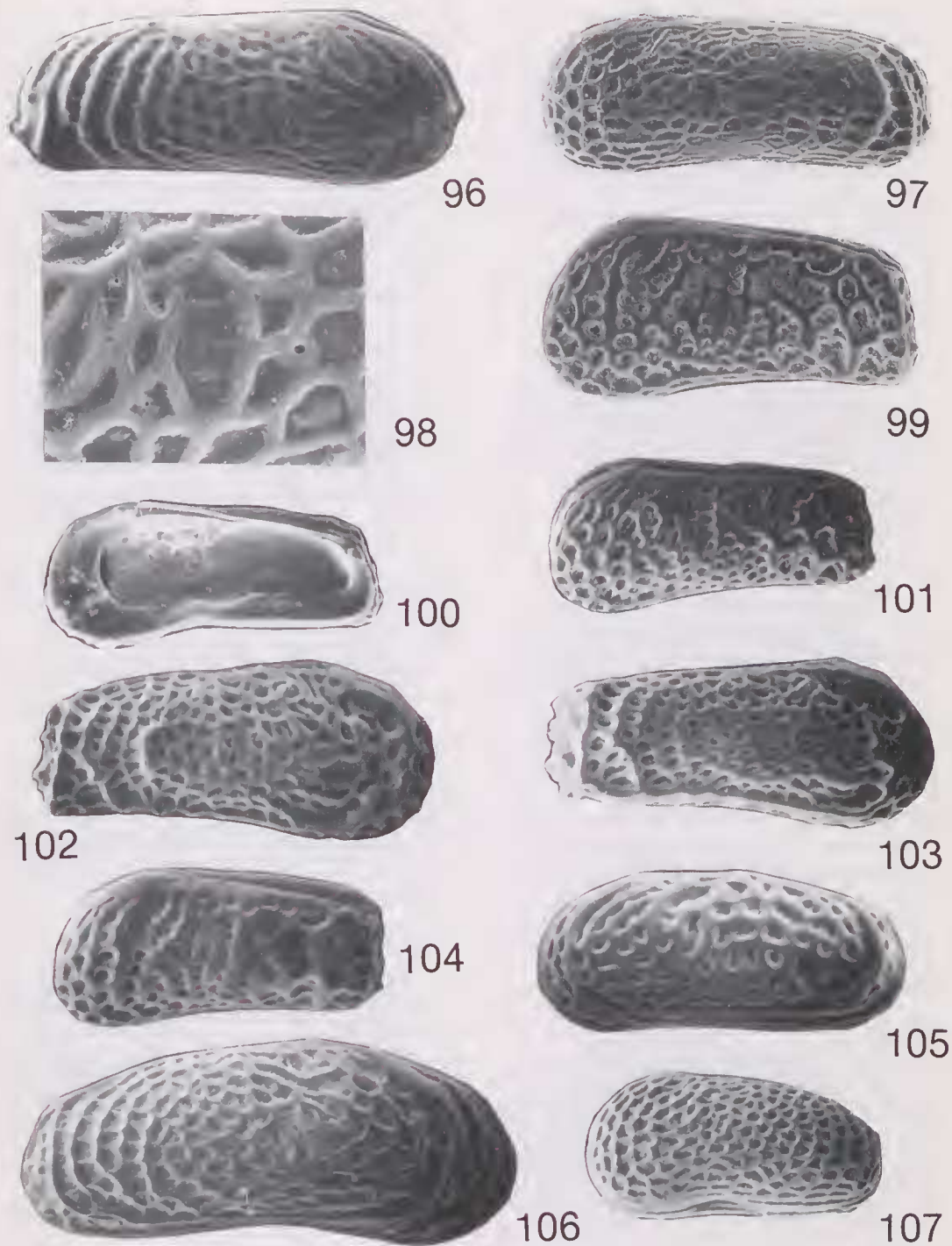
Notes. Distinguished readily from the type species by its smaller size and weaker ornament. The size difference is such that *H. parva* might be mistaken for an A-1 stage of *H. gesae* but since all internal features of *H. parva* are fully developed (visible through the translucent shell), in particular the lamellae and marginal pore canals, the specimens are adults of a smaller, different species rather than subadults of *H. gesae*.

Family Loxoconchidae Sars

Genus *Loxoconcha* Sars

***Loxoconcha broomensis* Hartmann**

(Figs 80, 82, 83)



Figs 96-107. SEM micrographs: **96**, *Praemunita broomensis*, ♀, external RV, × 299; **97,98**, *Praemunita hartmanni* — **97**, ♂, holotype, external LV, × 250; **98**, detail simple normal pore canals of two sizes, × 1010; **99-101**, *Labutisella darwinensis* — **99**, ♀, paratype, external LV, × 330; **100**, ♂, holotype, internal RV, × 200; **101**, ♀, paratype, external LV, × 200; **102**, *Labutisella quadrata*, ♀, paratype, external RV, × 200; **103**, *Labutisella interrupta*, ♂, holotype, external RV, × 200; **104**, *Labutisella curta*, ♀, holotype, external LV, × 200; **105**, *Mackenzicartia bentleyi*, ♀, paratype, external LV, × 200; **106**, *Parakeijia territoriae*, ♂, paratype, external RV, × 200; **107**, ?*Praemunita* sp., A-1 juvenile, external LV, × 200.

Loxoconcha broomensis Hartmann, 1978: 106.

Material. 1 ad. ♂ carapace, NTM Cr.005692, DN; 1 gerontic ♀ carapace, NTM Cr. 005694, DN; 31 (28 carapaces, 2 LV, 1 RV) mainly ad. including some gerontic individuals, with both sexes present, DN, in NTM; 18 carapaces, 32 RV, 13 LV including ad. of both sexes and several growth stages, PH1 and PH2, in NTM.

Dimensions. NTM Cr.005692 — L, 0.59; H, 0.34; B, 0.26. NTM Cr.005694 — L, 0.60; H, 0.42; B, 0.33.

***Loxoconcha georgei* Hartmann**
(Figs 8, 84, 85, 154)

Loxoconcha georgei Hartmann, 1978: 105.

Material. 1 ad. ♀ LV, NTM Cr.005693, HPSB; 21 (carapaces, LVs, RVs) including ad. of both sexes and several growth stages, HPSB, in NTM.

Dimensions. NTM Cr.005693 — L, 0.50; H, 0.32.

***Loxoconcha minyaustralis* sp. nov.**
(Fig. 81)

Type material. HOLOTYPE — 1 ad. ♀ RV, NTM Cr.005695, PH1. PARATYPES — 2 ad. ♀ RV, 1 ad. ♀ LV on assemblage slide, PH1, in NTM.

Diagnosis. This species belongs to the group of *L. australis* Brady, *L. broomensis* and *L. georgei*. It is differentiated from them by its smaller size, more regularly rhombic shape in lateral view, more distinct posterior cauda and more prominent anteroventral flexure.

Dimensions. Holotype — L, 0.46; H, 0.31.

Etymology. *minys* (Gk) = small; *australis* (L.) = southern.

Notes. For some time, we considered the possibility that this material was merely a different generation group of either *L. georgei* or *L. broomensis*; alternatively, that it was an ecophenotype of one of these two Hartmann species. On balance, it seems distinctive enough to warrant its own name and, because the specimens show some evidence of abrasion, it probably occupies a deeper niche. Examination of the hemipenis of an adult with soft parts would resolve the matter definitively but such does not occur in our material.

***Loxoconcha judithae* sp. nov.**
(Fig. 79)

Type material. HOLOTYPE — 1 ad. ♂ carapace, NTM Cr.005696, DN.

PARATYPE — 1 ad. ♀ carapace, NTM Cr.005697, DN. A gerontic ♂ carapace (PARATYPE, NTM Cr.005793), Dn. Other PARATYPES — 6 ad. carapaces 1 juv. LV, including both sexes and two growth stages, on assemblage slide DN, in NTM.

Diagnosis. This taxon is readily differentiated from other northern Australian *Loxoconcha* species by the pronounced concentric ribbing of the surface ornament and by rather weakly expressed sex dimorphism.

Dimensions. Holotype — L, 0.49; H, 0.30; B, 0.29. NTM Cr.005697 — L, 0.47; H, 0.30; B, 0.30. NTM Cr.005793 — L, 0.61; H, 0.32; B, 0.35.

Etymology. For the wife of the junior author, who accompanied him on the collecting trip to Darwin in September 1975.

***Loxoconcha dampierensis* Hartmann**

Loxoconcha dampierensis Hartmann, 1978: 106-107.

Material. 1 ad. ♂ LV, NTM Cr.005698, PH1; and 7 carapaces, 4 LV, 3 RV all ad. probably including both sexes, PH1 and PH2, in NTM.

Dimensions. NTM Cr.005698 — L, 0.47; H, 0.27.

***Loxoconcha variolata* Brady**

Loxoconcha variolata Brady, 1878: 400, Brady 1880: 121-122.

Material. 1 ad. ♂ carapace, NTM Cr.005699, DN; 3 ad. ♀ carapaces, 1 ad. ♂ carapace, plus a juv. carapace, DN, in NTM.

Dimensions. NTM Cr.005699 — L, 0.42; H, 0.22; B, 0.26.

***Loxoconcha* spp.**

Material examined. The Darwin assemblage contains two other *Loxoconcha* species but neither are represented by enough specimens to warrant description. They are stored together on slide Reg. No. NTM Cr.0005700.

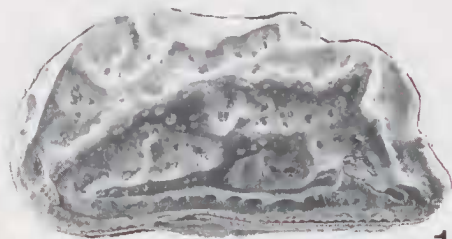
Genus *Loxoconchella* Triebel
***Loxoconchella pulchra* McKenzie**

(Figs 78, 153)

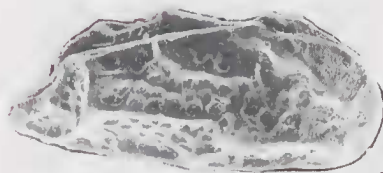
Loxoconchella pulchra McKenzie, 1967: 88-89.

Material. gerontic ♀ RV, NTM Cr.005701, PH1; 3 LV, 2 RV (including ad. and juv.), PH1, in NTM.

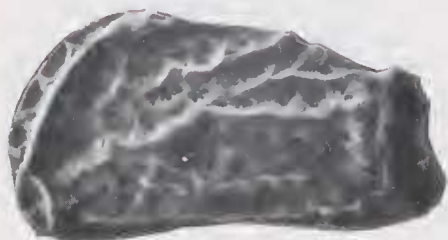
Dimensions. NTM Cr.005701 — L, 0.60; H, 0.47.



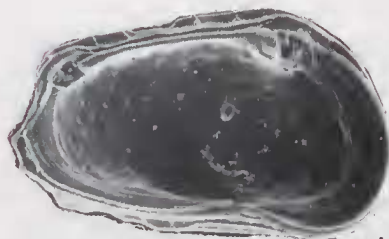
108



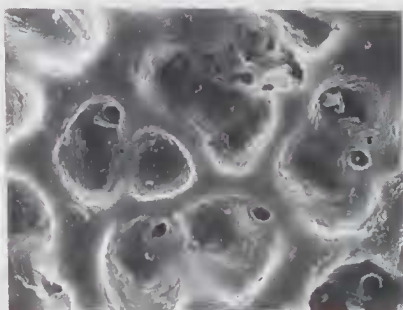
109



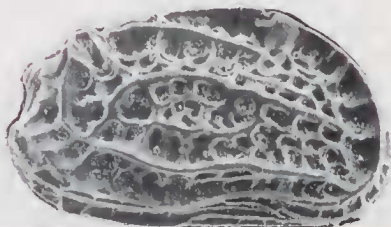
110



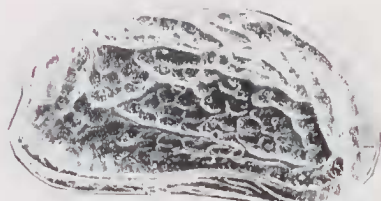
111



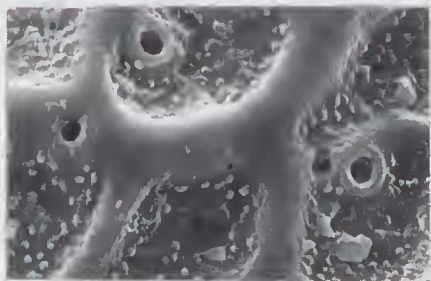
112



113



114



115



116

Figs 108-116. SEM micrographs: **108, 110**, *Orionina territoriae* — **108**, , paratype, external LV, $\times 220$; **110**, σ , paratype, external LV, $\times 200$; **109**, *Caudites* sp., oblique external RV, $\times 180$; **111-113**, *Mutilus splendideornatus australiensis* — **111**, f , internal LV, $\times 185$; **112**, detail normal pore canals, $\times 890$; **113**, f , external RV, $\times 190$; **114**, **115**, *Mutilus variornatus* — **114**, σ , external LV, $\times 190$; **115**, detail simple, rimmed normal pore canals, $\times 1900$; **116**, *Mutilus curvicostatus*, f , paratype, external LV, $\times 185$.

Family Paracytherideidae Puri
Genus Paracytheridea Mueller
Paracytheridea remanei Hartmann
 (Figs 70, 155)

Paracytheridea remanei Hartmann, 1964: 65-68; Hartmann 1978: 108-109.

Material. 1 ad. ♀ RV, NTM Cr.005702, PH1; 9 LV, 4 RV including ad. of both sexes, PH1 and Ph2, in NTM.

Dimensions. NTM Cr.005702 — L, 0.59; H, 0.285.

Notes. This species was described originally from the Red Sea. Later discussion by Hartmann (1978) indicates some hesitation in assigning his northwest Australian material to *P. remanei*. The taxon is clearly different to the southwest Pacific species *P. longicaudata* (Brady), based on examination of Brady's types at the Hancock Museum, Newcastle-upon-Tyne. It may well eventuate that these Australian populations warrant a new species name when better material becomes available.

Family Krithiidae Mandelstam

Genus Pseudopsammocythere Carbonnel
Pseudopsammocythere cf. reniformis Brady
 (Fig. 27)

?*Paradoxostoma reniforme* Brady, 1868:224.

?*Kritha reniformis* — Brady and Norman 1889:182

Kritha reniformis — Mueller 1894:348.

Pseudopsammocythere reniformis — Pugliese (pers. comm.), in: McKenzie, 1987:517).

Material. 1 ad. ♀ LV, NTM Cr.005703, DN; 1 ad. ♂ carapace, 1 ad. ♀ RV, DN, in NTM.

Dimensions. NTM Cr.005703 — L, 0.51; H, 0.19.

Notes. This genus is difficult to determine to species level because it is very rare and usually occurs as empty shells. Two Recent species based on soft parts are well known. Our species has the regular line of concrescence anteriorly that characterises *P. reniformis*; and is within its size range according to Mueller (1912). In *P. similis* Mueller the line of concrescence is flatly bowed anteroventrally. *P. tokyoensis* Yajima is more like *P. similis* in that its anterior line of concrescence is bowed, but anteromedially. *Pseudopsammocythere* sp. McKenzie and Swain is also like *P. similis*. *P. reniformis* has been recorded previously from the Bay of Biscay,

the Mediterranean (Mueller 1912) and the Red Sea (Bonaduce, Masoli, Minichelli and Pugliese 1980). It is regarded as a Lessepsian migrant (McKenzie 1987; 517). When a larger population, including adults with soft parts, is found, our taxon may well turn out to be a new species.

Family Microcytheridae Klie
Genus Microcythere Mueller

Microcythere cf. gottwaldi Hartmann

Microcythere gottwaldi Hartmann, 1978:

Material. 1 ad, ♂ carapace, NTM Cr.005704, PH1; ad. ♀ RV, NTM Cr.005706, PH2; and 1 ad. ♂ carapace, PH1, in NTM.

Dimensions. NTM Cr.005704 — L, 0.33; H, 0.13; B, 0.14. NTM Cr.005706 — L, 0.32; H, 0.15.

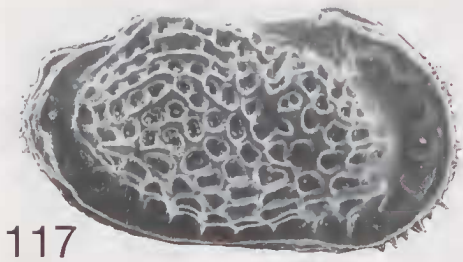
Microcythere logani sp. nov
 (Fig. 56)

Type material. HOLOTYPE — ad. ♂ carapace, NTM Cr.005705, HPSB. PARATYPES — ad. ♀ carapace, NTM Cr.005707, HPSB; 12 carapaces, 1 LV including adults of both sexes and a juvenile carapace, HPSB, in NTM.

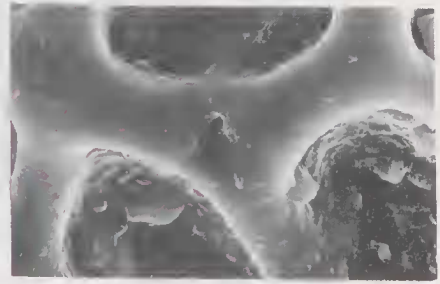
Description Carapace subarcuate, small, transparent, smooth; dorsum arched, greatest height posteromedial particularly in females; venter relatively straight, weakly inflexed anteromedially; anterior more narrowly rounded than posterior; subelliptical in dorsal view. Inner lamellae broader anteriorly than posteriorly, large anterior and posterior vestibules; line of inner margin regularly curved; marginal pore canals few, short; normal pore canals simple, open, rimmed; muscle scars indistinct but having usual cytheracean pattern of three to four central adductors plus large broadly v-shaped frontal scar and two small mandibulars; hinge lophodont type with simple terminal teeth on the RV that are accommodated in the LV; consequently LV overlaps RV dorsally; however, RV overlaps LV slightly posteroventrally. Sex dimorphism present, with ♀ relatively higher posteriorly than ♂.

Dimensions. Holotype — L, 0.37; H, 0.16; B, 0.13. NTM Cr.005707 — L, 0.38; H, 0.18; B, 0.14.

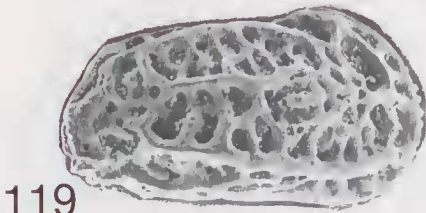
Etymology. For Dr Brian Logan, pioneer researcher on Shark Bay.



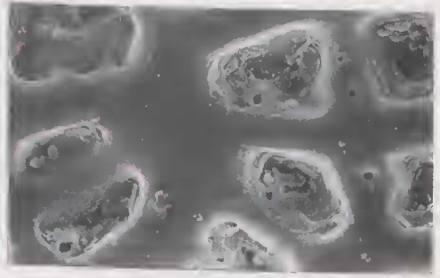
117



118



119



120



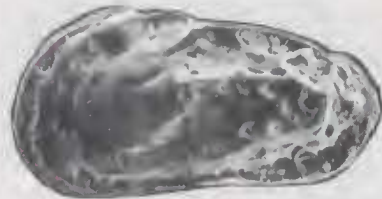
121



122



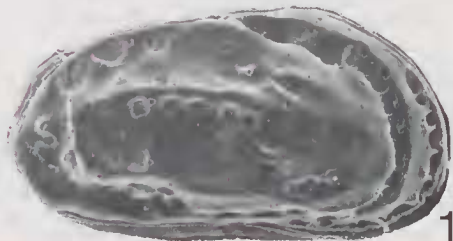
123



124



125



126

Figs 117-126. SEM micrographs: **117, 118**, *Neocytheretta ventrocostata* — **117**, ♀, paratype, external RV, × 230; **118**, detail simple normal pore canal, × 890; **119**, *Quasibradleya elongata*, ♂, holotype, external RV, × 155; **120**, *Bicornucythere* cf. *darwini*, detail simple normal pore canals, × 1000; **121, 122**, *Australimoosella liebauii* — **121**, detail simple normal pore canals, × 1870; **122**, ♂, external LV, × 250; **123**, *Australimoosella* sp., ♀, external RV, × 200; **124**, *Mackencythere* sp., ♂, external LV, × 200; **125**, *Yassinicythere* sp., A-1 juvenile, external LV, × 200; **126**, *Yassinicythere bassounii*, ♀, external RV, × 215.

Notes. *M. logani* is readily separated from *M. gottwaldi* and *M. dimorpha* Hartmann because both of these are much more strongly sex dimorphic and both, also, are smaller. *M. macphersoni* McKenzie is smaller and has a well marked dorsomedial sulcus that is not apparent in *M. logani*. No other microcytherids have been described from Australia.

***Microcythere* sp.**

(Fig. 55)

Material. 1 ad. ♀ carapace; NTM Cr.005708, PH1; 1 ad. ♀ carapace, 2 juv. carapaces, PH1 and PH2, in NTM.

Dimensions. NTM Cr.005708 — L, 0.37; H, 0.17; B, 0.15.

Notes. The shell of this taxon is more strongly calcified than the shell of either *M. gottwaldi* or *M. logani*; while in general shape and size it is reminiscent of *M. logani*. But, the hinge is quite distinct comprising in the RV an anterior simple tooth followed by a crenulate depression then a smooth median ridge then a posterior crenulate depression and, finally, a simple posterior tooth; LV complementary viz. simple socket, crenulate ridge (frontal element strongest), median groove, posterior crenulate ridge (hind element strongest), simple socket. This makes for stronger articulation of the valves. Such more complex hinge types are also known for other microcytherids, notably *M. gibba* Mueller from the Bay of Naples. When ♂ are found, this taxon will be described as a new species.

Family Leptocytheridae Hanai

Genus *Callistocythere* Ruggieri

***Callistocythere dorsotuberculata* Hartmann**

Callistocythere dorsotuberculata Hartmann, 1979: 227-228

Material. 1 ad. ♀ RV, NTM Cr.005709, PH1; 1 ad. ♀ carapace, PH1, in NTM.

Dimensions. NTM Cr.005709 — L, 0.35; H, 0.17.

Notes. These specimens are slightly smaller than the ranges recorded by Hartmann (1979, 1980) but the species is too distinctive to have been misidentified by us.

***Callistocythere keiji* (Hartmann) comb. nov.**

(Figs 4, 90, 91)

Leptocythere keiji Hartmann, 1978:77; Hartmann 1979:226; Hartmann 1981:102.

Leptocythere cf. *keiji* — Hartmann 1980:124.

Material. 1 ad ♀ RV, NTM Cr.005710, PH1; ad. ♂ RV, NTM Cr.005711, PH1; 15 carapaces, 3 RV 5 LV all ad. including both sexes, PH1 and PH2, in NTM.

Dimensions. NTM Cr.005710 — L, 0.42; H, 0.24. NTM Cr.005711 — L, 0.47; H, 0.22.

Notes. Some specimens from Port Hedland are smaller than the others but have the same surface sculpture (2 carapaces, 3 LV, 2 RV). We interpret these as a different generation group of *C. keiji*

***Callistocythere* cf. *insolita* McKenzie**

(Figs 86,87)

Callistocythere insolita McKenzie 1967: 83-85

Material. 2 ad. ♀ carapace, NTM Cr.005712, DN; ad. ♂ carapace; NTM Cr.005713, DN; ca 40 carapaces (1 later disarticulated) all ad. including both sexes, DN, in NTM.

Dimensions. NTM Cr.005712 — L, 0.50; H, 0.24; B, 0.24. NTM Cr.005713 — L, 0.52; H, 0.24; B, 0.22.

***Callistocythere warnei* sp. nov.**

(Fig. 89)

Type material. HOLOTYPE — ad. ♂ carapace, NTM Cr.005714, DN. PARATYPES — ad. ♀ carapace, NTM Cr.005715, DN; 19 other ad. carapaces (including both sexes), DN, in NTM.

Diagnosis. A *Callistocythere* characterised by strong transverse ribbing, the ribs initiating dorsally and either linking up medially or, as in the anteriormost and posterior regions, continuing to the ventral margin of the shell. The anterodorsal eye tubercle also is more prominent than in most other Australian species of the genus

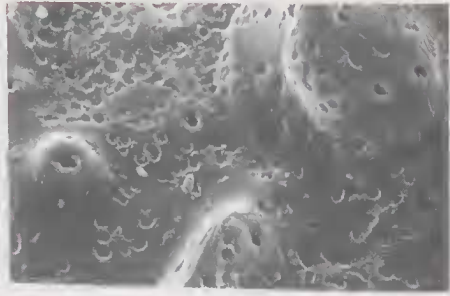
Dimensions. Holotype — L, 0.41; H, 0.20; B, 0.19. NTM Cr.005715 — L, 0.41, H, 0.20; B, 0.21.

Etymology. For Mr M.T. Warne, in recognition of his work on the Miocene Ostracoda of southeastern Australia.

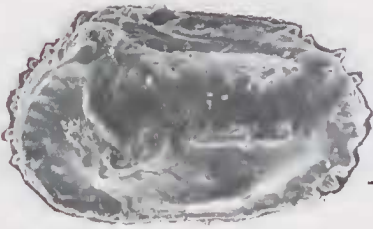
Notes. While sculptural variability is a recognised trait of some *Callistocythere* species (cf. Hartmann (1980) on *C. dorsotuberculata*), it is nevertheless true that the different forms are recognisable as related with respect to ornament and that the major elements of the sculptural pattern are constant. *C. warnei* cannot be linked to such taxa as *C. puri* McKenzie or *C. keiji* in this way. Further, *Callistocythere* is recognised as a



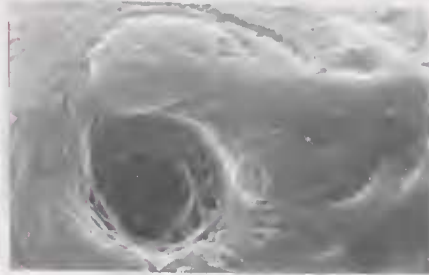
127



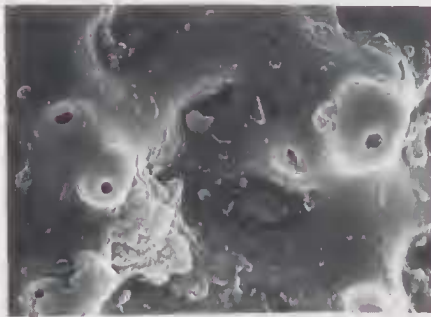
129



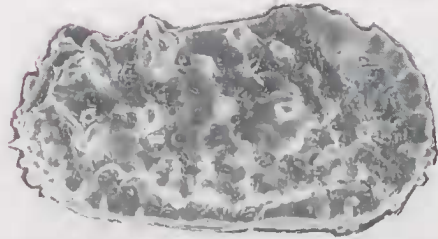
128



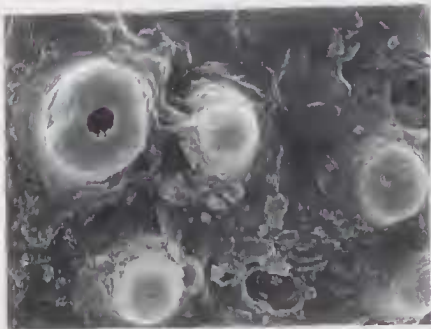
130



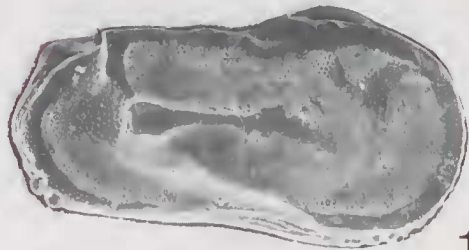
132



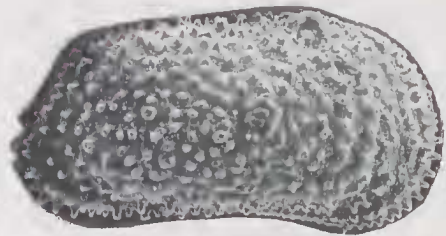
131



134



133



135

Figs 127-135. SEM micrographs: **127-130**, *Ponticocythereis costata* — **127**, ♂, external LV, × 170; **128**, ♀, external LV, × 150; **129**, detail celated normal pore canal, × 710; **130**, detail sieve type normal pore canal, × 5200; **131, 132**, *Actinoleberis arafurae* — **131**, ♀, paratype, external RV, × 250; **132**, detail celated normal pore canals, × 1559; **133, 134, 135**, *Echinocythereis melobesioides* — **134**, detail celated normal pore canal, × 1580; **135**, ♂, external RV, × 160.

much speciated genus that has radiated actively since its origin in the Late Eocene of Tethys and is species rich in the Indopacific. *C. warnei* is an expression of this evolutionary dynamism.

Callistocythere rhine sp. nov.

(Fig. 156)

Type material. HOLOTYPE — ad. ♀ carapace, NTM Cr.005716, HPSB. PARATYPES — ad. ♂ carapace, NTM Cr.005717, HPSB; 6 carapaces, 5 RV, 6 LV all ad. including both sexes, HPSB, in NTM.

Diagnosis. A species characterised by irregular transverse ribbing and intervening smooth areas forming a pattern unlike that of previously described taxa in the genus. Sex dimorphism present; ♀ longer and relatively less high and broad than ♂.

Dimensions. Holotype — L, 0.485; H, 0.27; B, 0.22. Ntm Cr.005717 — L, 0.545, H, 0.26; B, 0.22.

Etymology. *rhine* (Gk) = a shark with a rough skin; for Shark Bay, the type locality and the strongly ribbed ornament of this species.

Notes. This is a *Callistocythere* of the *insolita* group but with a distinctively different surface ornament of generally thicker transverse and other ribs having a different pattern to *insolita*. In dorsal view, ♀ are virtually parallel sided, unlike *C. insolita* in which the flanks are gently convex in dorsal view. *C. rhine* is the most saline tolerant Australian *Callistocythere* (60-65% salinity in Hamelin Pool).

Callistocythere neili sp. nov.

(Fig. 88)

Type material. HOLOTYPE — ad. ♂ carapace, NTM Cr.005718, DN. PARATYPES — ad. ♀ carapace, NTM Cr.005719, DN; 14 carapaces, 1 LV, 1 RV all ad., including 12 ♂ and 4 ♀, DN, in NTM.

Description. A yellowish *Callistocythere* with strong transverse and irregular ribs and well marked posterior transverse ridge behind which the shell continues to a broadly rounded posterior margin; also characterised by about 15 closely spaced anteroventral marginal denticles (in *C. insolita*, *C. warnei* and *C. rhine* these denticles are more widely spaced and number only seven or eight). Sex dimorphism typical for the genus. ♂ longer and relatively less high and broad than ♀.

Dimensions. Holotype — L, 0.49; H, 0.24; B, 0.22. NTM Cr.005719 — L, 0.42; H, 0.23; B, 0.23.

Etymology. For Mr J.V. Neil, in recognition of this thesis research on the Miocene Ostracoda of southeastern Australia.

Callistocythere spp.

Material examined. The Darwin collection contains two other species of *Callistocythere* but neither have enough suitable specimens to warrant description. They are stored together on slide Reg. No. NTM Cr.005720.

Genus *Leptocythere* Sars

Leptocythere cf. *lacustris* De Deckker

(Fig. 92)

Leptocythere lacustris De Deckker, 1981: 129-132.

Material. 1 A-1 ♂ LV, NTM Cr.005721, HPSB; and 4 carapaces, 12 RV, 11 LV all juv. including several growth stages, HPSB, in NTM.

Dimensions. NTM Cr.005721 — L, 0.46; H, 0.23.

Notes. This taxon is generally very similar to the species illustrated by De Deckker (1981) but adults would be rather larger than he records for *L. lacustris*. Also, De Deckker (*op. cit.*) states that *L. lacustris* is not known from salinities greater than normal marine (35%), whereas in Hamelin Pool salinities range from 60-65%, almost twice normal marine salinity (Logan and Cebulski 1970). When adults are available, therefore, this may prove to be a new species.

Leptocythere cf. *hartmanni* (McKenzie)

Callistocythere hartmanni McKenzie, 1967:81.

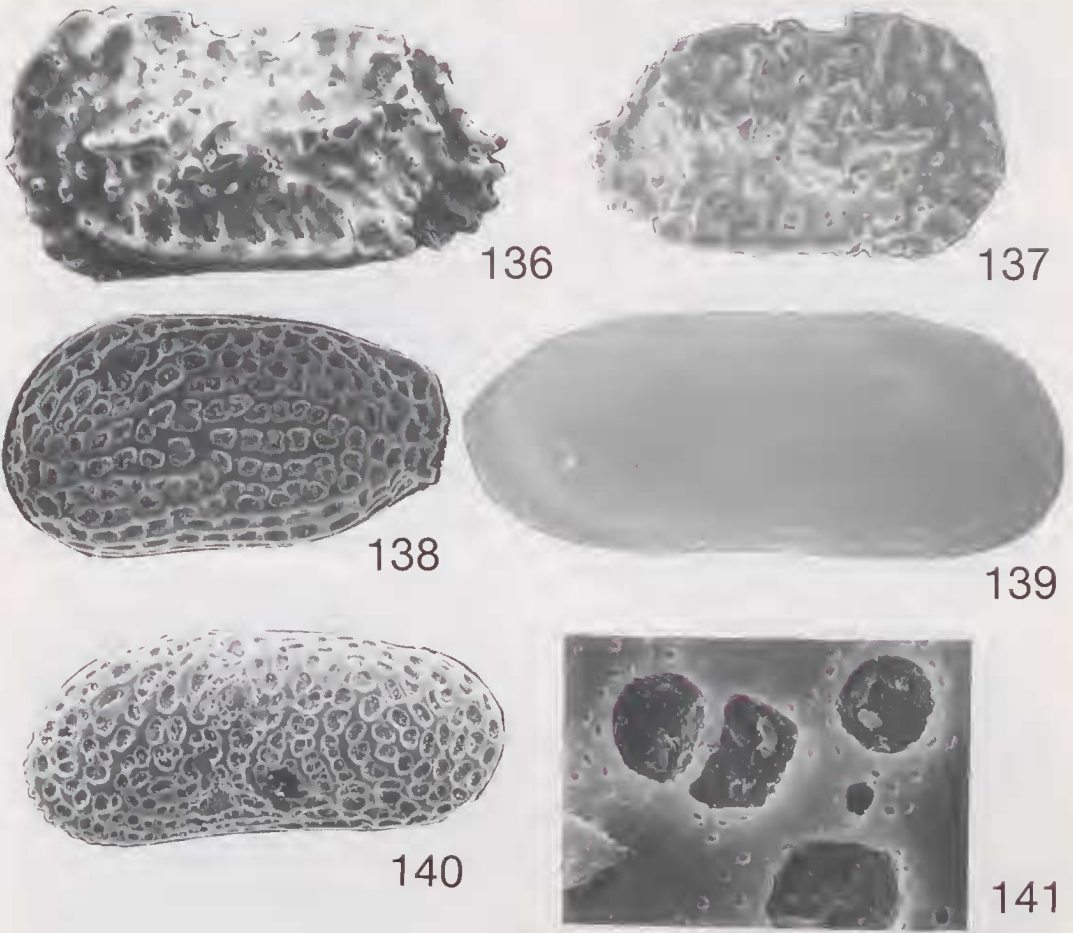
Leptocythere cf. *hartmanni* — Hartmann 1978:79.

Leptocythere hartmanni — Hartmann 1979:226; Hartmann 1980:123; Hartmann 1981:102.

Material. A-1 ♀ RV, NTM Cr.005722; PH1 ; 1 RV, 1 LV both juv. (2 growth stages), PH1, in NTM.

Dimensions. NTM Cr.005722 — L, 0.40; H, 0.21.

Notes. *L. hartmanni* is characterised by rather more sculptural expression than *L. lacustris* and is smaller. Our specimens most closely resemble those collected by Hartmann (1978) from northwestern Australia at near-marine salinities (32.1%). *L. hartmanni* and *L. lacustris* are atypical



Figs 136-141. SEM micrographs: **136, 137**, *Jugosocythereis henryhowei* — **136**, ♂, paratype, external LV, × 150; **137**, ♀, paratype, external RV, × 100; **138**, *Bicornucythere* cf. *darwini*, ♂, external LV, × 205; **139**, *Australimoosella paenenuda*, ♂, holotype, external RV, × 200; **140, 141**, *Arculacythereis* sp. — **140**, ♂, external LV, × 195, **141**, detail normal pore canal, × 3200.

Leptocythere, showing little shape resemblance to the type species and with different marginal areas, but having a similar surface sculpture; nor do they fit readily into *Callistocythere*. On the basis of soft parts, Hartmann (1978) believes an ascription to *Leptocythere* is justified and De Deckker (1981) follows his interpretation.

Genus *Tannella* Kingma
***Tanella gracilis* Kingma**

Tanella gracilis Kingma, 1948: 88-89.

Material. 1 ad. ♂ carapace, NTM Cr.005723, PH2; gerontic ♀ RV, Reg. No.005724, HPSB; 3 carapaces, 2 LV, all adults, including both sexes, plus a juvenile

LV, RV, on assemblage slides PH1, PH2 and HPSB, in NTM.

Dimensions. NTM Cr.005723 — L, 0.45; H, 0.20; 8, 0.19. NTM Cr.005724 — L, 0.51; H, 0.23.

***Tanella gracilis darwini* subsp. nov.**

(Fig. 93)

Type material. HOLOTYPE — ad. ♀ carapace, NTM Cr.005725, DN. PARATYPES — ad. ♂ carapace, NTM Cr.005726, DN; 12 carapace (9 ♀, 3 ♂) all ad. DN, in NTM.

Diagnosis. A subspecies of *T. gracilis* with very well marked riblets all over the shell,

such riblets only being developed partially in the nominate subspecies, which is also larger.

Dimensions. NTM Cr.005725 — L, 0.45; H, 0.21; B, 0.20. NTM Cr. 005726 — L, 0.41; H, 0.19; B, 0.18.

Etymology. For the type locality.

Leptocytherid spp.

Material examined. The Darwin and Port Hedland collections contain three other species referable to Leptocytheridae but the number of specimens is small in each case. One species could fall in *Tanella*; another is closer to *Callistocythere*; the affinity of the third species is not known. The taxa are stored by locality, viz. Reg. No. Cr.005727, two Leptocytherid spp. (Port Hedland); Reg. No. Cr.005728, three Leptocytherid spp. (Darwin).

Family Pectocytheridae Hanai

Genus *Keijia* Teeter

Keijia foveata (Hartmann) comb. nov.

(Figs 71-73, 158)

?*Pectocythere foveata* Hartmann, 1978:144.

Material. 1 ad. ♂ RV.LV, NTM Cr.005729, DN; 1 ad. ♀ carapace NTM Cr.005730 PH1; 21 carapaces, LV.1 RV, all ad., DN, in NTM; 5 carapaces, 4 RV, including 1 juv. RV, the remainder ad., PH1 and PH2, in NTM.

Dimensions. NTM Cr.005729 — L, 0.51; H, 0.215. NTM Cr.005730 — L, 0.51; H, 0.22; B, 0.20.

Keijia uordustraliae sp. nov.

(Fig.74)

Type material. HOLOTYPE — ad. ♂ carapace, NTM Cr.005731, DN. PARATYPES — ad. ♀ carapace, NTM Cr.005732 DN; 30 ad. carapaces including both sexes, DN, in NTM.

Description. A species of slightly smaller size than *K. foveata* but similar in general shape and having the characteristic broad anterior and posterior submarginal depressed areas on each valve as well as the usual 3-4 prominent posteroventral caudal denticles of a typical *Keijia*; surface covered with large, deep, irregular shaped pits separated by thick muri in species-specific pattern, as illustrated; greatest height anterior and less than half the length; anteromarginal and posterior caudal denticles present. Inner lamellae broad, except ventrally; marginal

pore canals few, unbranched, straight or flexuous; normal pore canals scattered, simple, open, rimmed; hinge pentodont with finely crenulate median bar; muscle scars comprising four central adductors in subvertical series, plus euspate frontal scar and two small mandibulars, dorsal scars present but their pattern not observed in detail. Sex dimorphism present, ♂ larger and relatively more elongate than ♀.

Dimensions. Holotype — L, 0.46; H, 0.18; B, 0.18 (other mature ♂ reach 0.48 in length). NTM Cr.005732 — L, 0.44; H, 0.20; B, 0.18.

Etymology. *nord* (AS) = North; and Australia.

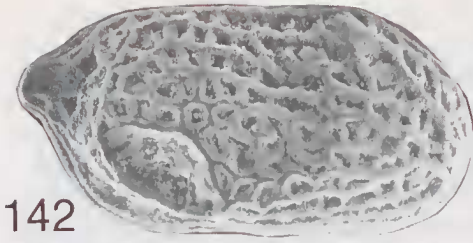
Notes. Distinguished easily from *K. foveata* by its coarser reticulation pattern.

Genus *Parakeijia* McKenzie gen. nov.

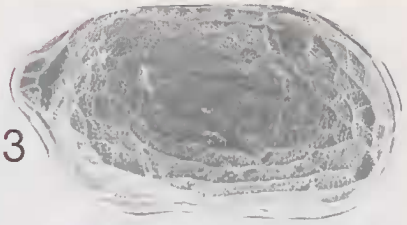
Type species *Parakeijia territoriae* sp. nov.

Diagnosis. Carapace elongate bean shaped; lacking an eye tubercle; entire surface reticulate; each valve also having two prominent transverse ribs anteriorly and posteriorly creating between themselves submarginal depressed areas like those in *Keijia* but narrower; the characteristic caudal denticles of *Keijia* usually absent (sometimes weakly discernible) so that in lateral view the valve posterior appears evenly and broadly rounded; anteromarginal denticles absent. Inner lamellae broad anteriorly and posteriorly, narrower ventrally, with anterior and posterior vestibules and few marginal pore canals; normal pore canals simple, open, rimmed; muscle scars of normal cytheracean type (four central adductors, cusped frontal scar, two small mandibulars); hinge modified pentodont, comprising in RV smooth, low, elongate anterior 'tooth' followed by long crenulate groove which anteriorly ends in two distinctly deeper and larger depressions and posteriorly ends in a large rounded socket, followed by prominent subquadrate tooth; LV having an elongate smooth groove, followed by crenulate median bar which anteriorly ends in two squarish miniteeth and posteriorly ends in a rounded tooth followed by deep subquadrate socket. Soft anatomy not yet known; presumed ♂ more elongate than presumed ♀.

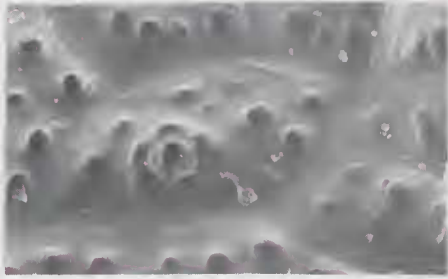
Etymology. *para* (Gk) = close to, near; and *Keijia*



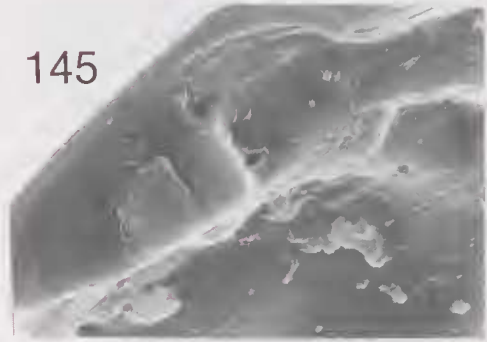
142



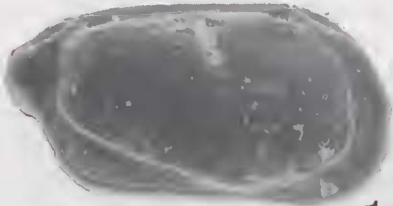
143



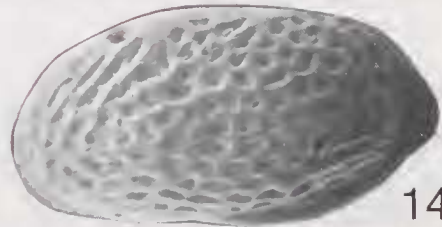
144



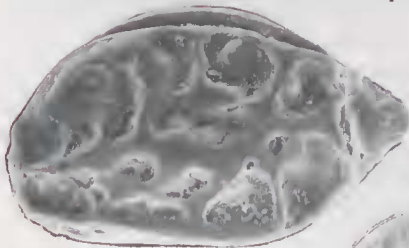
145



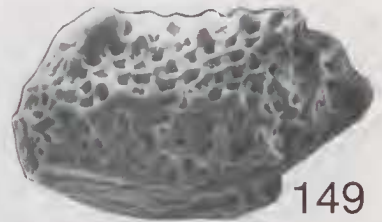
146



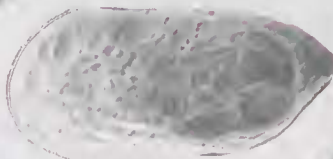
147



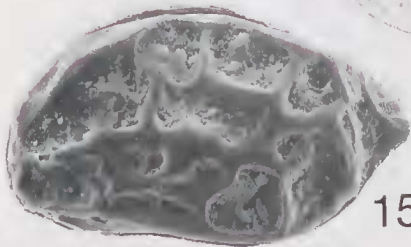
148



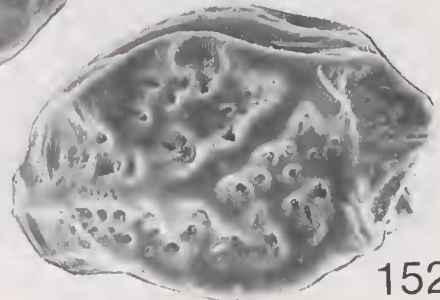
149



150



151



152

Figs 142-152. SEM micrographs: 142-146, *Cytherura densireticulata* — 142, ♂, external RV (heavily gold coated for SEM), × 265; 143, ♀, external RV, × 245; 144, detail normal pore canal, × 2600; 145, detail anterior hinge LV, × 2469; 146, ♀, internal LV, × 245; 147, *Cytherura nordoccidentalis*, ♂, paratype, external LV, × 200; 148, 151, *Hemiccytherura mackenziei* — 148, ♀, external LV, × 330; 151, ♂, external LV, × 310; 149, *Eucytherura* cf. *orientalis*, ♀, external LV, × 200; 150, *Semiccytherura* sp., A-1 juvenile, external LV, × 200; 152, *Kangarina* sp., ♀, external LV, × 370.

Notes. The genus clearly is close to *Keijia* but its more regular bean-like shape gives it also some resemblance to *Tanella*, although the latter has a quite different marginal pore canal pattern. It differs from *Keijia* in its anterior and posterior submarginal depressed areas (not as broad as in *Keijia*). The anterior hinge elements — low, long anterior tooth in RV, two squarish anterior miniteeth on the crenulate LV median bar — are different from the anterior hinge elements of *Keijia* s.s. Unlike *Keijia*, the new genus has no anteromarginal denticles and the posterior caudal denticles are either absent or indistinct. Overall, the genus shape is reminiscent of *Ishizakiella* McKenzie and Sudijoni but that genus lacks anterior and posterior transverse ribs, has no vestibules, has branching type marginal pore canals, and a modified entomodont hinge all of which separate it from *Parakeijia*. As yet *Parakeijia* is monotypic, but Indopacific species close to *Ishizakiella* or *Leptocythere* and aberrant-looking *Keijia* species ought to be checked more carefully to see if they belong in *Parakeijia*.

***Parakeijia territoriae* sp. nov.**

(Figs 28, 29, 75-77, 106, 157)

Type material. HOLOTYPE — ad. ♀ carapace, NTM Cr.005733, DN. PARATYPES — ad. ♂ carapace, NTM Cr.005734, Dn: 6 carapaces (4 ad., 2 juv.) including ad. of both sexes, on assemblage slide, DN, in NTM.

Additional material. 8 carapaces, 7 RV, 5 LV (1 RV, 3 LV juv. the remainder ad.), including both sexes, PH1 and PH2, in NTM.

Description. As for the generic diagnosis since *Parakeijia* is as yet monotypic.

Dimensions. Holotype — L, 0.54; H, 0.23; B, 0.22. NTM Cr.005734 — L, 0.54; H, 0.24; B, 0.22.

Etymology. *territorium* (L) — territory, for the type locality in the Northern Territory.

Genus *Gambiella* Witte

***Gambiella pytta* sp. nov.**

(Figs 94, 95)

Type material. HOLOTYPE — ad. ♀ carapace, NTM Cr.005735, DN. PARATYPES — 4 carapaces, 1 RV all ad., on assemblage slide, DN, in NTM.

Description. A *Gambiella* characterised by a surface ornament of rounded rather

deep pits and thick intervening muri; eye tubercle distinct; posterior subtriangular and relatively smooth (genus characteristic); height less than half the length; in dorsal view narrowly sagittate. Inner lamellae broad, with large anterior and less large posterior vestibules; marginal pore canals usually branched; normal pore canals sieve-type; hinge pentodont with a crenulate median element; central muscle scars comprising four adductors, a frontal scar and at least one mandibular scar. Sex dimorphism not determined (only ♀ available.).

Dimensions. Holotype — L, 0.41; H, 0.17; B, 0.15.

Etymology. *pytta* (AS) = pit.

Notes. Although only described recently, *Gambiella* is already recognised as a Tethyan relict genus; its distribution extends from the coast of West Africa to the Indo-pacific and Pacific, missing the Caribbean and Mediterranean, a typical discontinuous Tethyan pattern. Of the three known species *G. pytta* is easily differentiated from *G. caudata* (Brady) which has elongate pits and from *G. caelata* Witte (the type species) which also has elongate pits but with a fine interior micro-ornament of spinule-like points. *Gambiella* is a somewhat atypical pectocytherid because it has a distinct eye tubercle whereas other genera in the family are blind; on the other hand it has a typical pectocytherid hinge, valve overlap and marginal areas. Probably, the genus merits separate tribal status.

Genus *Mackenziartia* Bentley

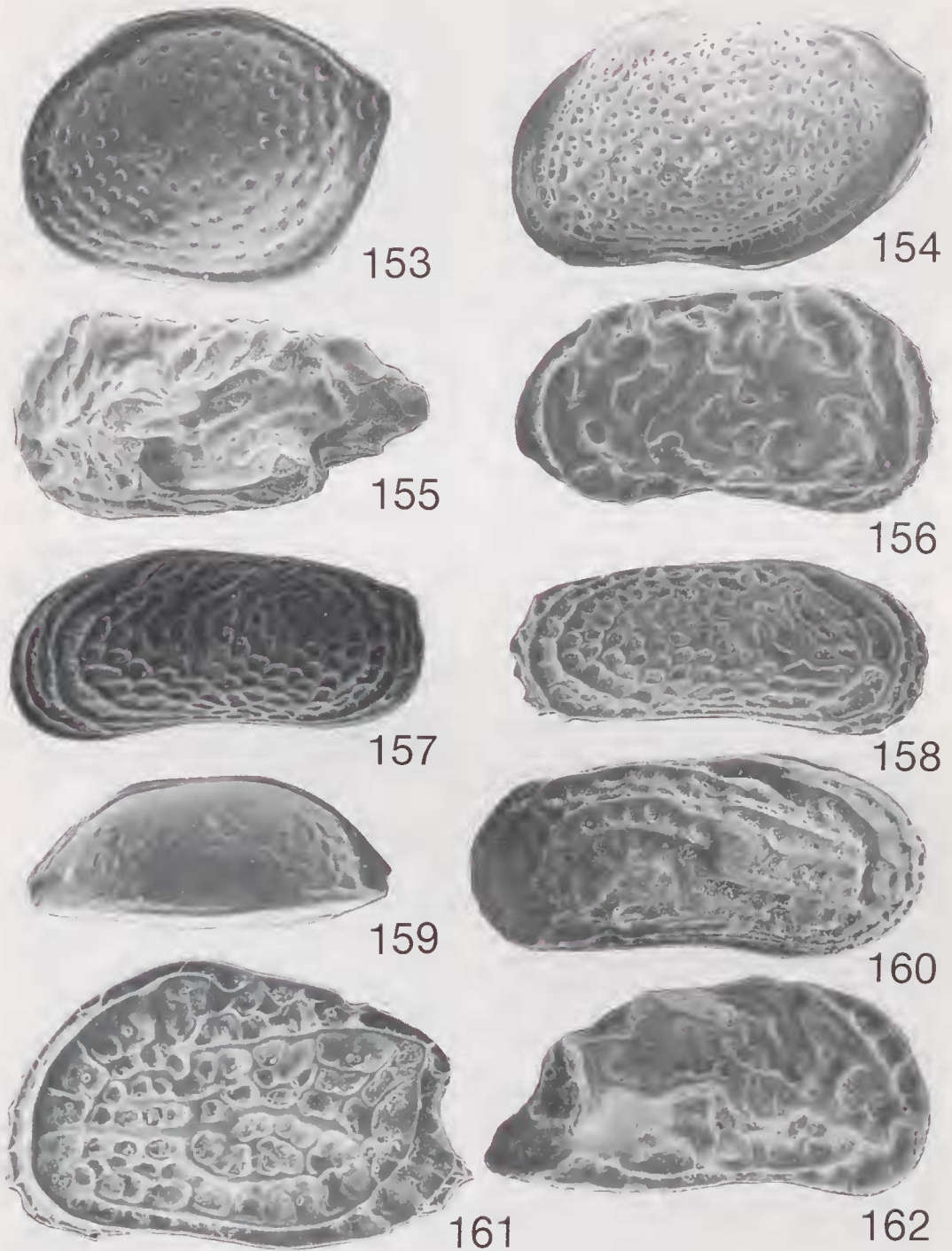
***Mackenziartia bentleyi* sp. nov.**

(Fig 32, 105)

Type material. HOLOTYPE — ad. ♂ carapace, NTM Cr.005736, DN. PARATYPE — ad. carapace, NTM Cr.005737, DN.

Additional material. 50 carapaces, 5 RV, 5 LV nearly all adults, including both sexes, on assemblage slides DN, PH1 and PH2, in NTM.

Description. Carapace small, elongate subrectangular in lateral view; surface reticulate with rounded pits and thickened muri which form several concentric ridges anteriorly and posteriorly; adductor muscle scars occupying elongate central depression in each valve; anterior more broadly rounded than posterior; dorsum slopes slightly towards the rear; venter nearly straight;



Figs 153-162. SEM micrographs: **153**, *Loxoconchella pulchra*, ♀, external LV; **154**, *Loxoconcha georgei*, ♂, external LV; **155**, *Paracytheridea remanei*, ♀, external LV; **156**, *Callistocythere rhine*, ♀, paratype, external RV; **157**, *Parakeijia territorica*, ♀, paratype, external LV; **158**, *Keijia foveata*, ♂, external RV; **159**, *Microxestoleberis hamelini*, ♂, paratype, external RV; **160**, *Yassinicythere* sp. (Hartmann), ♂, external RV; **162**, *Mutilus curvicostatus*, ♀, paratype, external LV; **162**, *Caudites* cf. *javana*, ♀, external RV. Scale line 0.1mm. Figs 153-159, 161-162 to same scale.

height about half the length; in dorsal view, subelliptical, more narrowly rounded in front and broadest behind the middle. Inner lamellae moderately broad with large anterior vestibule; marginal pore canals few, short, usually straight; normal pore canals scattered, simple, open, rimmed; hinge modified pentodont with crenulate median element; muscle scars comprising four adductors in subvertical series, single frontal scar and two small mandibulars. Sex dimorphism weakly expressed, ♀ relatively higher than ♂

Dimensions. Holotype — L, 0.38; H, 0.17; B, 0.17. Ntm Cr.005737 — L, 0.37, 0.19; B, 0.18.

Etymology. For Mr C. Bentley, ostracodologist colleague, who recently described the genus.

Notes. This appears to be the species referred to by Hartmann (1978) as '*Pectocythere portjacksonensis* (McKenzie 1967). While *portjacksonensis* is certainly congeneric with *bentleyi* it differs in size and in the anteroventral reticulation pattern (cf. McKenzie 1967: Pl. 12, Fig. 6, Hartmann 1978: Pl. 14, Figs 4-14).

Genus *Praenuunita* Labutis gen. nov.

Type species *Praenuunita broomensis* (Hartmann, 1978).

Diagnosis. A pectocytherid genus characterised by tubular carapace; strongly reticulate surface with narrow concentric ridges anteriorly and posteriorly; posterior margin weakly denticulate; height less than half length. Inner lamellae broad anteriorly and posteroventrally; with axehead shape anterior vestibule and elongate posterior vestibule; marginal pore canals few, straight to flexuous and simple; normal pore canals scattered simple, open, rimmed; hinge pentodont, median element slightly arched anteriorly otherwise straight; muscle scars comprising four elongate adductors, one or two frontal scars and small mandibulars, a rounded fulcral scar is also usually distinct. Sex dimorphism strong, ♀ shorter than ♂. Soft anatomy known for one species (Hartmann 1978). Antennules five segmented; antennae with well developed terminal endopod segments having three claws, antennal exopod (Spinnborste) long, reaching to the tips of the endopod claws; mandible coxale characterised by a very prominent anterior tooth; mandible epipod bearing two

fine ray-like setae (Strahlen); maxillule epipod with two mouthwards-directed Strahlen; maxillule palp small and subquadrate; bristle formulae of the three walking legs 22/221/010 on the protopodites; furca with two ringed bristles; posterior of the ♀ body stumpy carrying a short thick bristle. ♂ soft anatomy not yet known. Since there is no eye tubercle the animal presumably is blind.

Etymology. *praemunitus* (L.) = fortified in front, for the concentric ridges giving an apparently thickened anterior.

Notes. *Praenuunita* is one of several new genera described by Labutis in a recent thesis (Labutis 1977, unpublished). The name was published by Hartmann (1978: 146) as a *nomen nudum* ascribed to Labutis. This, therefore, is its formal validation.

Praenuunita broomensis (Hartmann) comb. nov.

(Fig. 96)

?*Pectocythere broomensis* Hartmann, 1978:145.

Material. 1 ad. ♀ carapace, NTM Cr.005738, DN; 4 carapaces, 2 LV, 1 RV all ad. including both sexes, DN, in NTM; 2 juv. carapaces, 1 adult ♀ RV, PH1, in NTM.

Dimensions. NTM Cr.005738 — L, 0.44; H, 0.19; B 0.16 (♂ reach 0.47 in length).

Praenuunita hartmanni sp. nov.

(Figs 30, 97, 98)

Type material. HOLOTYPE — ad. ♂ LV, NTM Cr.005739, DN. PARATYPES ad. ♀ carapace, NTM Cr.005740 — , DN; 19 carapaces, 5 LV, 3 RV mostly ad. including both sexes, on assemblage slide, DN, in NTM.

Description. Carapace elongate, tubular; surface reticulate with several anterior and posterior transverse ridges, the latter more distinct; dorsum straight; venter inflexed medially; anterior broadly rounded, bearing seven — eight marginal denticles; posterior subtruncate with indistinct posteroventral denticles; parallel sided in dorsal view; height less than half the length. Inner lamellae broad anteriorly and posteroventrally with a prominent anterior vestibule; marginal pore canals few, short and straight anteriorly, few but longer posteriorly; normal pore canals scattered simple, open, rimmed, some much larger than others (Fig. 98);

hinge pentodont; muscle scars comprising four central adductors in a subvertical series, plus a v-shaped frontal scar, mandibulars not observed. Sex dimorphism distinct, ♀ shorter than ♂.

Dimensions. Holotype — L, 0.44; H, 0.16; B, 0.15. NTM Cr.005740 — L, 0.39; H, 0.17; B, 0.15.

Etymology. For Prof. Dr Gerd Hartmann in recognition of his contributions on Australian Ostracoda.

Notes. This species is smaller than *P. broomensis* and has a more distinct sex dimorphism, less well defined anterior transverse ridges and fewer but stronger posterior transverse ridges. The frontal reticulation pattern is also distinctive, especially in ♂ (Fig. 97).

?*Praemunita* sp.

(Fig. 107)

Material. A-1 ♀ carapace, NTM Cr.005741, DN; 11 carapaces, all A-1 ♀, on assemblage slide, DN, in NTM.

Dimensions. NTM Cr.005741 — L, 0.35; H, 0.17; B, 0.13.

Notes. This taxon cannot be assigned confidently to either *P. broomensis* or *P. hartmanni*. When adults are known it may well be described as a new species, closer to *P. hartmanni* than to *P. broomensis*.

Genus *Labutisella* McKenzie gen. nov.

Type species *Labutisella darwinensis* sp. nov.

Diagnosis. A pectocytherid genus of small size; with an elongate subrectangular shape in lateral view, and parallel sided in dorsal view but more or less distinctly indented near both ends; anteromarginal and posteroventral caudal denticles weak to distinct; surface ornament of heavier reticulations that in *Praemunita* and more or less distinct marginal depressed areas in front and rear which are not as broad as in *Keijia*. Inner lamellae broad, with large anterior and, usually, small, triangular posteroventral vestibules; marginal pore canals few, short and straight to flexuous anteriorly, longer ventrally and posteriorly; normal pore canals simple, open, rimmed; hinge pentodont with a crenulate median element; muscle scars similar to *Praemunita*. Sex dimorphism present, ♂ more elongate than ♀. No eye tubercle. Soft anatomy as yet unknown.

Etymology. For Mr V.R. Labutis, Ezzo Australia Ltd., in recognition of his excellent thesis on north Queensland marine Ostracoda.

Notes. *Labutisella* is close to *Praemunita* and *Keijia* but displays the following differences: parallel sided dorsal view with subterminal front and rear indentations (like *Keijia*, unlike *Praemunita*); heavier reticulation than *Praemunita*; different shaped anterior and posterior vestibules; smaller size. Further, *Keijia* has a different hinge (low elongate anterior tooth in RV, unlike *Labutisella*). *Parakeijia* is considerably larger than *Labutisella*, unlike it, has indistinct rear caudal denticles and no anteromarginal denticles.

The familial group *Gambiella*, *Keijia*, *Parakeijia*, *Mackenziartia*, *Praemunita*, *Labutisella* and *Morkhovenia* is a prominent element in northern Australian faunas from Western Australia to Queensland. Of these genera, only *Keijia*, *Morkhovenia* and *Gambiella* are as yet known beyond Australian waters.

Labutisella darwinensis sp. nov.

(Figs 31, 99-101)

Type material. HOLOTYPE — ad. ♂ RV, NTM Cr.005742, DN. PARATYPES — ad. ♀ carapace, NTM Cr.005743, DN; ad. ♀ carapace, NTM Cr.005797, DN; 33 carapaces, 5 LV, 3 RV mostly ad. including both sexes in about equal proportions, on assemblage slide, DN, in NTM.

Description. Carapace small, elongate subrectangular; highest anteriorly with the height less than half the length; reticulate, with rounded reticules and thickened intervening muri which are most prominent in the transverse direction; dorsum straight, sloping rearwards; venter inflexed medially; anterior broadly rounded with indistinct marginal denticles; posterior obliquely subtruncate with two to three main posterior caudal denticles; parallel sided in dorsal view with subterminal indentations at both ends. Internal features as described for the genus. Sex dimorphism distinct, ♂ longer, relatively less high and slimmer than ♀.

Dimensions. Holotype — L, 0.36; H, 0.16; B, 0.13. NTM Cr.005743 — L, 0.39; H, 0.16; B, 0.16.

Etymology. For the type locality.

Labutisella interrupta sp. nov.

(Fig. 103)

Type Material. HOLOTYPE — ad. ♂ carapace, NTM Cr.005744, DN. PARATYPES — ad. ♀ carapace, NTM Cr.005745, DN; 7 carapaces 1 RV, 1 LV all adult, including 7 ♀ carapaces and a ♂ LV, RV, on assemblage slide, Dn, in NTM.

Description. A small *Labutisella* with a more elongate carapace than *L. darwinensis*, especially in ♂, and an overall reticulate surface ornament which is characterised anteroventrally and posteroventrally by large lacunae; of these the more anterior of the two posteroventral lacunae interrupts the straight ventromarginal line of the ornament in each valve; anteromarginal and posterior caudal denticles distinct. Internal features as described in the generic diagnosis. Sex dimorphism well developed, ♂ longer and less high than ♀.

Dimensions. Holotype — L, 0.42; H, 0.165; B, 0.14. NTM Cr.005745 — L, 0.39; H, 0.18; B, 0.14.

Etymology. *interrupta* (L.) = interrupted.

Labutisella quadrata sp. nov.

(Fig. 102)

Type material. HOLOTYPE — ad. ♀ RV, NTM CR.005746, DN. PARATYPES — 2 ad. ♀ carapaces, 1 ad ♀ LV, on assemblage slide, DN, in NTM.

Diagnosis. A *Labutisella* with a quadrate carapace that is relatively higher than other species in this small genus and is characterised by a well marked, squared off posterior ridge in addition to the usual reticulate surface ornament; anteromarginal and posterior caudal denticles distinct. When ♂ are found they should measure about 0.45mm.

Dimensions. Holotype — L, 0.42; H, 0.19; B, 0.16.

Etymology. *quadrata* (L.) = quadrate.

Notes. *L. quadrata* is distinguished from *L. darwinensis* and *L. curta* by its greater size and well developed marginal denticles; from *L. interrupta*, which has a similiar surface reticulation, it can be distinguished by its less elongate carapace and squared off posterior ridge. It is the most *Keijia* — like species of *Labutisella* but can be separated from *Keijia* species by its finer reticulation, different anterior hinge elements and inner marginal areas.

Labutisella curta sp. nov.

(Fig. 104)

Type material. HOLOTYPE — ad. ♀ carapace, NTM Cr.005747, DN. PARATYPES — 2 carapaces, 1 LV, 1 RV all ad. ♀, on assemblage slide, DN, in NTM.

Description. A *Labutisella* characterised by its small shell, shorter than other species in the genus, and by a reticulate ornament in which concentric anterior and posterior ridges are developed somewhat as in *Praemunita* species. The anteriormost and two most posterior of these ridges are slightly raised above the remainder of its surface ornament. Anteromarginal denticles are weak but posterior caudal denticles are well developed. Internal features as in the generic diagnosis. Sex dimorphism likely to be distinct but no ♂ occur in the available material.

Dimensions. Holotype — L, 0.33; H, 0.16; B, 0.15.

Etymology. *curta* (L.) = short

Notes. When first examined this species was thought to be represented by only juveniles; however, when a carapace was opened it was evident that the material consisted of adults since the internal features were fully developed.

Family Hemicysteridae Puri
Subfamily Hemicysterinae Puri
Genus *Mutilus* Neviani

Mutilus variornatus Hartmann

(Figs 114, 115)

Mutilus variornatus Hartmann, 1978: 98-99.

Material. 1 ad. ♂ carapace, NTM Cr.005748, PH1; 7 carapaces (one opened later), 3 RV, 8 LV, including ad. of both sexes and juv., on assemblage slide, PH1, in NTM.

Dimensions. NTM Cr.005748 — L, 0.56; H, 0.31; B, 0.23.

Mutilus splendideornatus australiensis
Hartmann

(Figs 111-113)

Mutilus splendideornatus australiensis Hartmann, 1978: 99-100.

Material. 1 ad. ♀ LV, NTM Cr.005749, PH1; 1 ad. ♀ carapace, NTM Cr.005794, PH2; 3 carapaces, 12 RV, 6 LV including ad. of both sexes and juv., on assemblage slides PH1 and PH2, in NTM.

Dimensions. NTM Cr.005749 — L, 0.54; H, 0.32; B, 0.25. NTM Cr.005794 — L, 0.56; H, 0.31.

Notes. Hartmann (1974) described *M. splendideornatus* from the coast of Mozambique and subsequently made *australiensis* a subspecies of that taxon (Hartmann 1978). From his illustrations these taxa are clearly very similar and sustain Hartmann's thesis of considerable overall homogeneity in the Indopacific ostracode fauna.

***Mutilus* cf. *parallelcostatus* Hartmann**

Mutilus parallelcostatus Hartmann, 1978: 100-101.

Material. 1 ad. ♂ carapace, NTM Cr.005750, DN; 6 ad. carapaces, including 1 ♂ and 5 ♀, DN, in NTM.

Dimensions. NTM Cr. 005750 — L, 0.57; H, 0.32; B, 0.25.

Notes. The surface ornament of ribs and reticulations in these specimens is closely similar to that illustrated for *M. parallelcostatus* except that the ribs are uniformly thicker in the Darwin material. This variation is likely a rhopic factor effect (McKenzie and Peypouquet 1984), i.e. ecophenotypic, rather than indicating a possible new subspecies.

***Mutilus curvicostatus* sp. nov.**

(Figs 116, 161)

Type material. HOLOTYPE — ad. ♀ carapace, NTM Cr.005751, DN. PARATYPES — 7 ad. carapaces, including 2 ♂ and 5 ♀, on assemblage slide DN, in NTM.

Description. A species of *Mutilus* distinguishable from the other described Australian species by a prominent strongly curved rib which follows the ventral and posterior margins from the anteroventral to the posterodorsal regions of each valve, and a less marked inner curved rib which runs from the median to the posterodorsal regions of each valve joining the stronger curved rib near the posterodorsal corner. The large spherical eye tubercle of this species is also more prominent than the eye tubercles of other Australian species of *Mutilus*, especially the more austral taxa such as *M. pumilus* (Brady).

Dimensions. Holotype — L, 0.60; H, 0.35; B, 0.28.

Etymology. *curvus* (L.) = curved; *costatus* (L.) = ribbed.

Subfamily Orioninae Puri
Genus *Caudites* Coryell and Fields
***Caudites* cf. *javana* Kingma**

(Fig. 162)

Caudites mediales var. *javana* Kingma, 1948: 85.

Caudites javana Keij, 1953: 159.

Material. 1 ad. ♀ carapace, NTM Cr.005752, DN; 30 carapaces, mostly ad. including both sexes, DN, in NTM.

Dimensions. NTM Cr.005752 — L, 0.55; H, 0.29; B, 0.23.

***Caudites* sp.**

(Fig. 109)

Material. 1 ad. ♂ carapace, NTM Cr.005795, DN.

Dimensions. NTM Cr.005795 — L, 0.53; H, 0.26; B, 0.24.

Notes. The assignments of this and the previous species to *Caudites* follow established opinion (Kingma 1948; Hartman 1978). However, they may be closer to *Orionina* Puri, 1953 than to *Caudites* s.s.

Genus *Orionina* Puri

***Orionina territoriae* sp. nov.**

(Figs 36, 108, 110)

Type material. HOLOTYPE ad. ♂ carapace, NTM Cr.005753, DN. PARATYPES — ad. adult ♀ carapace, NTM Cr.005754, DN; 1 ad. LV, NTM Cr.005796, DN; 9 carapaces 2 RV, 1 LV all ad. including both sexes, on assemblage slide, DN, in NTM.

Description. Carapace subquadrate, medium sized, valves ornamented with strong ribs and intervening minor riblets which create a coarse reticulation; the major ribs include a transverse posterior rib from which several others trend anteriorly, one following the ventral margin, another subdiagonally across the shell to its anteroventral corner, a third to the subcentral tubercle, two others more dorsally; yet another strong rib runs from the prominent eye tubercle ventrally, following the margin, until it links with the subdiagonal ridge near the anteroventral corner of valve; the anterior and ventral shell margins are denticulate; dorsum weakly convex; venter inflexed medially; anterior broadly rounded; posterior subtruncate and caudate posteroventrally; height about half length; dorsal view subhastate, greatest breadth posteromedial at the posterior transverse ridge and about half the

length. Inner lamellae moderately broad lacking vestibules, pillar structures large and lobate (Fig. 36), marginal pore canals straight to flexuous, often thickened medially, numbering 35-45 anteriorly, fewer ventrally and posteriorly; selvage well developed; normal pore canals scattered simple, open, rimmed; hinge holamphidont with large anterior teeth in both RV and LV, smooth median element and large RV posterior tooth; muscle scars indistinct, appear to comprise four adductors (one divided) plus two frontal scars, mandibulars not observed. Sex dimorphism distinct, ♀ higher than ♂.

Dimensions. Holotype — L, 0.56; H, 0.25; B, 0.25. NTM Cr.005754 — L, 0.54; H, 0.29.

Etymology. *territorium* (L.) = territory, for the N.T.

Notes. In shape and ornament our species is not unlike *Ambostracon* Hazel but that genus lacks the pillar structures which characterise Orioninae. Its characteristics are also similar to *Caudites* but, according to van den Bold (1963), *Caudites* species are not denticulate ventrally nor are they reticulate. This is the first record of *Orionina* from the Indopacific.

Genus *Echinocythereis* Puri

Echinocythereis melobesioides (Brady) comb. nov.

(Figs 134, 135)

Cythere melobesioides Brady, 1868:162;
Brady 1880:108

Trachyleberis melobesioides — Hornibrook
1952:17

Material. 1 ad. ♂ Rv, NTM Cr.005755, PH1; 2 RV, 2 LV, including 1 adult ♀ RV, the remainder A-1 juveniles, on assemblage slide PH1, in NTM.

Dimensions. NTM Cr.005755 — L, 0.70; H, 0.35.

Notes. This taxon while never represented by many specimens, turns up regularly in Indopacific assemblages from Mauritius to Ceylon to Australia (Brady 1868, 1880, 1886). The Australian records probably include a reference to *Cythere scabra* Munster, 1830 (*non scabra*) from the Abrolhos Islands, W.A. in Brady (1866).

We follow Hazel (1967) in placing the Echinocytherideinae with the family Hemicytheridae. Liebau (1975) produced a revision of Trachyleberididae in which Hemicytherinae were included as a compo-

nent subfamily and Echinocytherideinae reduced to tribal status but still associated with hemicytherines. Hartmann (1978) included a brief discussion of Liebau's work but nevertheless maintained Hemicytheridae as a separate family although transferring Echinocytherideinae to Trachyleberididae. It seems clear that no conclusive view has yet been reached and we are inclined, therefore, to follow Hazel's original opinion especially in view of our poor comparative material.

Family Thaerocytheridae Hazel

Genus *Quasibradleya* Benson

Quasibradleya elongata sp. nov.

(Fig. 119)

Type material. HOLOTYPE — ad. ♂ carapace NTM Cr.005756, PH1. PARATYPES — 3 RV, LV all juveniles of two growth stages, on assemblage slide PH1, in NTM.

Description. Carapace medium sized; elongate subrectangular; ornamented with strong longitudinal and marginal ridges and intervening transverse costae which form large reticules giving overall coarsely reticulate appearance; the main ridges are an antero- to ventromarginal ridge, a curved dorsal ridge, and an irregular median ridge (genus character); valves denticulate anteriorly and to less extent posteriorly where there is a short caudal process; eye tubercle indistinct connected by riblets to the dorsal and median ridges; immediately below the eye tubercle is a large subcircular reticule; greatest height anteromedial and about half the length; greatest breadth post-cromedial due to posteroventral expansion of the valves and over half the length. Inner lamellae moderately broad, without vestibules and with numerous flexuous to straight marginal pore canals; normal pore canals include simple open and ciliated pores as well as sieve pores; hinge hemiamphidont; central muscle scars comprising four adductors in subvertical series, plus two frontal scars and two mandibulars. Sex dimorphism as yet unconfirmed but likely to be distinct with ♀ relatively higher than ♂.

Dimensions. Holotype — L, 0.68; H, 0.33; B, 0.36.

Etymology. *elongata* (L.) = elongate.

Notes. Although the material is scanty, this record is important as confirming that

the range of *Quasibradleya*, for which many southern Australian species are known (including Tertiary fossils), extends at least to northwestern Australia.

Genus *Jugosocythereis* Puri

***Jugosocythereis henryhowei* McKenzie sp. nov.**

(Figs 12, 136, 137)

Pterygocythereis (?) sp. "(Jurien, 71)" Hartmann, 1978: 91.

Type material. HOLOTYPE — ad. ♀ RV, NTM Cr.005757, PH1. PARATYPE ad. ♀ LV, NTM Cr.005758, PH1.

Additional material. 1 ad. RV ♂ 1 ad. RV, LV ♀, 8 RV, one LV juv. — three growth stages in all, on assemblage slides PH1 and PH2, in NTM.

Description. Carapace medium sized, subquadrate with a distinct subcaudal process armed with several strong spines; surface ornamented with ridges, the dorsal one consisting of several coarse flat topped spines partly coalesced in adult ♀ but entirely coalesced in the single adult ♂ RV available; ventromarginal ridge prominent and inflated posteriorly; subcentral tubercle large with a distinct straight rib leading off it anteriorly and a weak rib lower and posterior of this; height over half the length in ♀, about half the length in ♂; eye tubercle prominent, subspherical. Inner lamellae moderately wide, without vestibules; marginal pore canals fairly numerous, straight to flexuous, selvage weak; normal pore canals both sieve type and simple, open celled; hinge hemiamphidont with crenulate median element; central muscle scar pattern comprising four adductors in subvertical series, plus two frontal scars and close set mandibulars. Sex dimorphism distinct, ♂ more elongate than ♀.

Dimensions. Holotype — L, 0.64; H, 0.32. NTM Cr.005758 — L, 0.63; H, 0.36.

Etymology. For the late Professor Henry Van Wagenen Howe, pioneer ostracodologist and valued mentor in taxonomy to the junior author.

Notes. This is the species which Hartmann (1978) recorded as *Pterygocythereis* (?) sp. "(Jurien, 71)" but *Pterygocythereis* is more elongate has a more triangular cauda and lacks any subcentral tubercle. Usually, it is associated with Brachyocytherinae and not with Bradleyinae in which Benson (1972)

specifically included *Jugosocythereis* (and omitted *Pterygocythereis*) when establishing the subfamily.

Family Trachyleberididae Sylvester Bradley
Subfamily Trachyleberidinae Sylvester Bradley

Genus *Ponticocythereis* McKenzie

***Ponticocythereis costata* (Hartmann) comb. nov.**

(Figs 127-130)

Actinocythereis scutigera, in part, subspecies *costata* Hartmann, 1978:87. (not *Actinocythereis scutigera* (Brady) 1868: 70-71)

Material. 1 ad. ♂ carapace, NTM Cr.005759, DN; 1 ad. ♀ carapace, NTM Cr.005760, DN; 1 ad. ♂ carapace, DN, in NTM; 2 RV, 1 LV ad. ♀, 1 RV ♂, 3 juv. carapaces, 14 RV, 13 LV juveniles, on assemblage slide HPSB, in NTM.

Dimensions. NTM Cr.005759 — L, 0.67; H, 0.35; B, 0.35. NTM Cr.005760 — L, 0.63; H, 0.39; B, 0.35.

Notes. Hartmann (1978) referred the taxon to *Actinocythereis scutigera* (Brady) and made *costata* a new subspecies. However, examination of Brady's 'Fonds de la Mer' types in the collection of the Hancock Museum, Newcastle-upon-Tyne makes it clear that this taxon has little relationship at species level with *scutigera*, in which the shell is shield-like (rather higher with respect to its length than *costata*) and ornamented with large bosses. Further, the genus characters do not match *Actinocythereis* Puri either in shell ornament or, more significantly, in soft anatomy — antennule, antenna, mandible and hemipenis (Keyser 1977; Hartmann 1978; Wouters 1981). While some details of these differences may be due to incomplete descriptions the hemipenis distinctions are too obvious to be ignored. In *Actinocythereis* s.s. the copulatory tube is very short, in *Ponticocythereis*, it is long and powerful; the nearby appendage is wedged shaped in *Actinocythereis*, but hook-like in *Ponticocythereis*.

P. costata is an atypical member of the genus in that its ornament consists of strong ridges whereas close-set, flat topped spines are more typical. However, A-1 and younger juveniles of *P. costata* have an ornament of close-set, flat topped spines.

Genus *Bradyleberis* McKenzie gen. nov.

Type species *Bradyleberis cristatella* (Brady, 1880).

Diagnosis. A trachyleberidid with an elongate subrectangular carapace that in dorsal view is relatively compressed anteriorly but broadens posteriorly; denticulate anteriorly and posteroventrally; surface micropunctate (under high magnification each puncta is shown to have a round central plug), ornamented also by low marginal ridges around its entire perimeter with a right angled termination posterodorsally plus a median ridge ending over the weak subcentral tubercle region; eye tubercle present. Inner lamellae moderately broad, without vestibules; marginal pore canals numerous, relatively straight; normal pore canals scattered, simple, open; hinge amphidont; central muscle scars comprising four adductors in a subvertical series plus a v-shaped frontal scar and two small mandibulars. Sex dimorphism distinct, ♂ more elongate than ♀.

At present the genus is considered to be monotypic. Soft anatomy unknown.

Etymology. For George Stewardson Brady, F.R.S. who pioneered the study of Recent Australian marine Ostracoda (Brady 1866); and *leberis* (Gk) = sloughed skin.

Notes. *Bradyleberis* is unlike any previously described ostracode genus in its general shape apart from some resemblance to *Idiocythere* Triebel. Unlike *Idiocythere*, however, which lacks them *Bradyleberis* bears low flattened ridges and has an eye tubercle (E. Triebel personal communication, 1966). It is a rare but typical clement in the near-shore shelf fauna of northern Australia, with a known range extending from near Derby, W.A. to Gladstone in north Queensland (Labutis 1977, unpublished).

***Bradyleberis* cf. *cristatella* (Brady)
comb. nov.**

(Figs 33, 133)

Cythere cristatella Brady, 1880:90.

Material. 1 ad. ♂ carapace, NTM Cr.005761, DN; 2 ad. ♀ carapaces, DN, in NTM.

Dimensions. NTM Cr.005761 — L, 0.69; H, 0.33; B, 0.29.

Notes. It is clear that *B. cristatella* is a northern Australia form. The only related species from southern Australia are

Palaeogene fossils referred to *Idiocythere* by McKenzie (1974). *B. cristatella* has never been recorded by Hartmann (1978 *et seq.*) and was not found around Melbourne by McKenzie (1967) nor does it occur in the junior author's large collection from Bass Strait (McKenzie unpublished). Off northern Australia, it occurs in the Sahul Shelf fauna (McKenzie 1976) and in the Arafura Sea (McKenzie unpublished) apart from the Darwin, Booby Island and Gladstone records cited earlier.

Genus *Bicornucythere* Schornikov and Shaitarov

***Bicornucythere* cf. *darwinii* (Brady) comb. nov.**

(Figs 34, 120, 138)

Cythere darwini Brady, 1868:71.

not *Cythere darwini* Brady, 1880:177.

not *Thalmannia darwini* — McKenzie and Sudijoni, 1981:38

Material. 1 ad ♂ carapace, NTM Cr.005762, DN; 30 carapaces, 2 RV, 2 LV all ad. (some valves were disarticulated after sorting) including 8 ♂ and 26 ♀, on assemblage slide DN, in NTM.

Dimensions. NTM Cr.005762 — L, 0.57; H, 0.31; B, 0.25.

Notes. In his "Challenger" report, Brady (1880) ascribed and figured specimens from Hong Kong and Japan as this species, which he had described earlier (Brady 1868) from North Watcher Island off northern Java. When the two reports are compared it is obvious that the later one refers to a different taxon, especially since Brady omits any mention of the longitudinal arrangement of ribs and deep reticules in the "Challenger" specimens, whereas this characterised the original material collected near Java. The error was compounded recently by McKenzie and Sudijono (1981) whose figures (*op. cit.*: Pl. 3, Figs 7,8) relate to yet another species.

The genus *Bicornucythere* might be confused with *Keijella* Ruggieri or *Thalmannia* Le Roy. *Thalmannia* is less elongate than *Bicornucythere*. *Keijella*, on the other hand is similar in general shape but differs in hinge structure especially as regards the respective anterior elements (Doruk 1973: Pl. 1:9:56, Fig. 2; Schornikov and Shaitarov 1979: Pl. 3, Fig. 3a).

Genus *Actinoleberis* McKenzie gen. nov.

Type species *Actinoleberis arafurae* sp. nov.

Diagnosis. A trachyleberidine genus characterised by relatively small size and a distinctive ornament which includes a marginal ridge extending from in front of the eye tubercle around the anterior and venter to the posteroventral region, anteromarginal denticulations, and numerous blunted spines and tubercles giving an overall prickly appearance. Eye tubercle present. Sex dimorphism weak, presumed ♀ more elongate than presumed ♂. Inner lamellae moderately broad, without vestibules; selvage weak, marginal; marginal pore canals numerous, flexuous, long, normal pore canals simple, open, rimmed and also ciliated; hinge amphidont with a crenulate median element; central muscle scars comprising four adductors in a subvertical series plus, usually, a broadly v-shaped frontal scar, mandibulars indistinct. Soft anatomy unknown.

Etymology. *aktinos* (Gk) = ray, beam (often used in zoological nomenclature to imply spinose); *leberis* (Gk) = sloughed skin.

Notes. The main characteristic of this genus is its relatively small size for a trachyleberidine. Its marginal ridge resembles that of *Carinocythereis* Ruggieri which, however, is much larger, and also has a discontinuous median and a dorsal ridge, and is confined to the North Atlantic and Mediterranean. At present, *Actinoleberis* is monotypic.

***Actinoleberis arafurae* sp. nov.**

(Figs 35, 131, 132)

Type material. HOLOTYPE — ad. ♂ carapace, NTM Cr.005763, DN. PARATYPES — ad. ♀ carapace, NTM Cr.005764, DN; 41 carapaces, all adults, comprising 12 ♂ and 29 ♀, DN, in NTM.

Description. As for the generic diagnosis since the genus is monotypic.

Dimensions. Holotype — L, 0.44; H, 0.24; B, 0.23. NTM Cr.005764 — L, 0.42; H, 0.25; B, 0.25.

Etymology. *arafurae* = for the Arafura Sea, where this species also occurs abundantly (McKenzie and Freeman, unpublished).

Notes. This taxon shows variation in shell ornament and thickness that appears to be a

rhopic factor effect and leads to rather large ranges in measurements — ♀ 0.41 — 0.445mm in length, ♂ 0.435-0.47mm in length.

Some specimens have two frontal scars (Fig. 35) instead of a single v-shaped frontal scar. When the soft part anatomy is known, therefore, this genus may have to be transferred to another subfamily.

Genus *Australimoosella* Hartmann***Australimoosella liebau* Hartmann**

(Figs 121, 122)

Australimoosella liebau Hartmann, 1978: 94-95.

Material. 1 ad. ♂ LV, RV, NTM Cr.005765, DN; 1 ad. ♀ RV, NTM Cr.005766, PH1; 16 carapaces, 2 RV, DN, in NTM; plus 2 RV, 2LV, PH1, in NTM; mostly ad. (only 2 juveniles), including both sexes.

Dimensions. NTM Cr.005765 — L, 0.50; H, 0.22; B, 0.19. NTM Cr.005766 — L, 0.60; H, 0.28.

Notes. This species was described by Labutis (1977 unpublished) as *Campylocythereis* sp. His record extends its range to northern Queensland (Gladstone harbour).

***Australimoosella paenenuda* sp. nov.**

(Fig. 239)

Type material. HOLOTYPE — ad. ♂ RV, NTM Cr.005767, DN. PARATYPES — ad. ♀ carapace, NTM Cr.005768, DN; 4 carapaces, including 2 ad. ♂ 1 ad. ♀ 1 A-1 juv. 1 A-2 juv., DN, in NTM. One ♂ carapace opened to confirm some generic characters with a consequent breakage of the LV (holotype).

Description. An *Australimoosella* characterised by almost complete lack of ornament except for some indistinct concentric pits in the anterior and posterior. Inner lamellae moderately broad, without vestibules; marginal pore canals about 20 anteriorly, fewer posteriorly, generally straight, some widened at their bases; normal pore canals scattered, simple, open, rimmed; hinge weakly amphidont, with crenulate median element and less prominent anterior tooth than typical amphidont genera; subanterodorsal muscle attachment platform prominent; muscle scars comprising four adductors in subvertical series plus v-shaped frontal scar, mandibulars close set, indistinct. Sex dimorphism quite marked, ♀ broader and higher than ♂.

Dimensions. Holotype — L, 0.59; H, 0.25; B, 0.22. NTM Cr.005768 — L, 0.60; H, 0.25; B, 0.22.

Etymology. *paene* (L.) = almost; *nuda* (L.) = nude, unadorned.

Notes. Labutis (1977, unpublished) described this taxon as a species of *Campylocythereis* Omatsola. That genus, however, while similar in shape and in lack of ornament, has a better developed amphidont hinge and distinctly different normal pore canals, including some sieve type pores (Omatsola 1971).

Australimoosella sp.

(Fig. 123)

Material. 1 ad. ♂ carapace, NTM Cr.005769, PH1; 1 ad. ♀ carapace, NTM Cr.005770, PH1; and 1 ad. ♀ 1 ad. ♂, plus one RV juvenile, on assemblage slide, PH1 in NTM.

Dimensions. NTM Cr.005769, L. 0.56; H, 0.25; B, 0.25. NTM Cr.005770 — L. 0.60; H, 0.29; B, 0.25.

Notes. These specimens represent a problem. The ♂ is even less ornamented than *A. paenenuda*, while the ♀ show a surface pattern similar to *A. liebau*, but not as strongly expressed as in specimens of *A. liebau* from the same locality. Possibly they represent individuals of *A. liebau* which have been affected by the rhopic factor so that their genotypic ornament has become degraded. Such variations in ornament are common in Australian species (Hartmann 1982) and are useful in ecological interpretation as they indicate variations in environmental (ambient) carbonate levels at the times when different individuals of the same species go into molt.

Genus *Yassinicythere* McKenzie gen. nov.

Type species *Yassinicythere bassiounii* (Hartmann, 1978).

Diagnosis. A trachyleberidid genus characterised by medium size and a subrectangular carapace (in lateral view) that is ornamented by prominent sagittal dorsal and median ridges, a less well marked ventral ridge and an anteromarginal ridge; the remaining surface may be fossate, reticulate or even smooth in some individuals (Hartmann 1978: pl. 7, figs 6-16); eye tubercle distinct; height about half the length; narrower anteriorly in dorsal view. Inner lamel-

lae moderately broad with distinct anterior and weakly developed posterior vestibules; marginal pore canals moderately numerous, mostly straight and unbranched; normal pore canals scattered, simple, open, some rimmed; hinge modified amphidont type characterised by an elongate, crenulate anterior tooth, crenulate median furrow and crenulate postjacent tooth in the RV with complementary socket, ridge socket in the LV; both valves carrying prominent and diagnostic ridge-like, short, subanterodorsal muscle attachment platform; central muscle scars comprising four adductors in subvertical series, plus v-shaped frontal scar and at least one relatively large manibular scar. Sex dimorphism distinct, ♂ more elongate than ♀.

Soft anatomy known for the type species and characterised by very long distal bristles on the second segment of the six-segmented antennule; two terminal claws on the antennal endopod; well developed antennal spinneret bristles in both sexes, (slightly longer for ♂); two extra long epipodial Strahlen on the mandible basale; similar proximal bristles on the P1, P2 protopodites, both thick and hirsute; a minute proximal bristle on the P3 protopodite; a subtriangular frontal capsule on each hemipenis, without a spinose terminal point as in *Hiltermannicythere* Bassiouni, 1979 s.s and not terminally retroussée as in *Moosella* Hartmann, 1964 s.s.

Etymology. For Dr Iradj Yassini, Lake Illawarra Management Committee, Wollongong, New South Wales, an ostracodologist colleague who concurs in the distinctiveness of this taxon.

Notes. In its hingement, the prominent subanterodorsal muscle attachment platform and in features of the soft anatomy cited above the new genus seems more closely related to *Australimoosella* Hartmann, 1978 than to *Hiltermannicythere* where Hartmann (1978) placed it. The latter is a northern Atlantic, Mediterranean and Red Sea genus which belongs in a different trachyleberidid subfamily (with such genera as *Celtia* Neale, 1973). The subanterodorsal muscle attachment platform is a feature of taxa in the subfamily *Campylocytherinae* Puri, 1960; this is not discussed by Hartmann (1978). Nevertheless, as Australian Ostracoda become better known, *Australimoosella* Hartmann (where *Yassinicythere* belongs,

with *Australimoosella*) may come to be accepted as a tribe of campylocytherine trachyleberidids.

***Yassinicythere bassiounii* (Hartmann)
comb. nov.**
(Fig. 126)

?*Hiltermannicythere bassiouni* Hartmann, 1978:91.

Hiltermannicythere bassiouni — Hartmann 1979:232; Hartmann 1980:130.

Material. 1 ad. ♀ carapace, NTM Cr.005771, DN; and 6 carapaces, DN, in NTM; plus 4 carapaces, 5 RV, 5 LV, PH1 and PH2, in NTM; mostly adults including both sexes.

Dimensions. NTM Cr.005771 — L, 0.54; H, 0.28; B, 0.26.

***Yassinicythere* sp. (Hartmann)**
(Fig. 160)

Hiltermannicythere spec. Hartmann 1978:93.

Material. 1 ad. ♀ LV, NTM Cr.005772, PH2; 1 ad. LV (broken), on assemblage slide PH2, in NTM.

Dimensions. NTM Cr.005772 — L, 0.54; H, 0.26.

Notes. Described as *Hiltermannicythere* spec. by Hartmann (1978: Pl. 7, Figs 15, 16).

***Yassinicythere* sp.**
(Fig. 125)

Material. Broken ad. ♀ LV, NTM Cr.005773, HPSB; and 5 LV, 9 RV all juv. (2 growth stages), on assemblage slide, HPSB, in NTM.

Dimensions. NTM Cr.005773 — L (estimated) 0.66; H, 0.36.

Notes. This taxon is so much larger than *Y. bassiounii* that on size alone it could be regarded as a distinct species. Unfortunately, the lone broken adult valve is insufficient for description. As several growth stages are present, the species probably is autochthonous in Hamelin Pool, Shark Bay, W.A. Fig. 125 represents a juvenile LV.

Genus *Mackencythere* Malz and Ikeya
***Mackencythere* sp.**

(Fig. 124)

Material. 1 ad. ♂ RV, LV, NTM Cr.005775, PH1.

Dimensions. NTM Cr.005775 — L, 0.46; H, 0.24.

Notes. In establishing *Mackencythere*, Malz and Ikeya (1982: 416-417) provided an extended discussion on the affinities of sev-

eral related genera of which *Yassinicythere* and *Australimoosella* also occur in our material. In view of the soft part similarities already discussed and their differences from both *Moosella* s.s. and *Hiltermannicythere* s.s. these genera when better known will probably form at least a tribal group, virtually confined to the western Pacific and Australasia, but most diverse (on present knowledge) in Australian waters. The genus in this group that most resembles *Mackencythere* is *Sinoleberis* Hu which, however, has a strongly amphidont hinge with a powerful anterior tooth and large weakly lobate posterior tooth in the RV. In *Mackencythere*, both these elements while still prominent are broad and weakly crenulate — a more primitive hingement than that of *Sinoleberis*.

Subfamily Arculacythereinae Hartmann

Genus *Arculacythereis* Hartmann

***Arculacythereis* sp.**

(Figs 140, 141)

Material. 1 ad. ♂ carapace, NTM Cr.005776, PH1; 3 LV, 2 RV juv. representing two growth stages (A-1, A-2), on assemblage slides PH1 and PH2, in NTM.

Dimensions. NTM Cr.005776 — L, 0.68; H, 0.31; B, 0.25.

Notes. This form resembles closely *Arculacythereis* sp. A recorded and figured by Labutis (1977 unpublished: Pl. 27, Figs 16, 17). His material came from Curtis Channel, Gladstone harbour, north Queensland. While the number of specimens is few, our record is important as suggesting homogeneity in the northern Australian Ostracoda, an idea reinforced by studying Hartmann (1978, 1981).

***Arculacythereine* sp.**

Material. 1 ad. ♂ LV, NTM Cr.005774, PH1; plus 1 carapace, 4 RV, 3 LV all juv., on assemblage slide, PH1, in NTM.

Dimensions. NTM Cr.005774 — L, 0.68; H, 0.32.

Notes. Differs from the previous taxon by being smooth rather than pitted but has a similar outline and internal characters.

Trachyleberidid spp.

Material. 6 carapaces (4 ad.), DN; 1 LV ad. ♂, plus 2 carapaces, 3 LV, 2 RV juv., PH1 and PH2.

Notes. Of the Darwin material, three adult carapaces represent probably the same species illustrated by Hartmann (1978: Pl. 7, Figs 17, 18) as *Trachyleberis* (?) spec. (Broome 19). In our opinion, this taxon is not a *Trachyleberis s.s.* The remaining carapace from Darwin (an adult ♂) and the LV adult ♀ from Port Hedland represent a new trachyleberidid genus. Two LV juveniles from Port Hedland represent a large trachyleberidid of uncertain affinities. The remaining Port Hedland material — two carapaces, two RV, three LV all juveniles — is probably *Bicornucythere* but of an indeterminate species. These several taxa are stored by locality on two separate slides: Reg. No. Cr.005777 (Darwin); and Reg. No. Cr.005778 (Port Hedland).

Family Cytherettidae Triebel
Genus *Alocopocythere* Siddiqui

Alocopocythere reticulata indoaustralis
Hartmann

Alocopocythere reticulata indoaustralis
Hartmann 1978: 90

Material. 1 A-1 RV; NTM Cr.005779, PH1; and 2 LV (1 broken), A-1 juv., PH1, in NTM.

Dimensions. NTM Cr.005779 — L, 0.53; H, 0.30.

Notes. Hartmann (1978) places *Alocopocythere* in the Echinocytherideinac, but since there is only a single frontal scar it seems more appropriate to include the taxon with Cytherettidae, especially as the closely similar-looking genus *Neocytheretta* has typical broad and irregular cytheretid inner lamellae, and because regular inner lamellae are not unknown in Cytherettidae (cf. the several South American cytheretid genera). Our placement of the genus in Cytherettidae, based on the muscle scar pattern, follows Hazel (1967). However, the precise taxonomic position is not all that clear. *Alocopocythere* has a cytheretid-like antennule but its antenna seems closer to that of *Henryhowella sarsi* (Mueller, 1894) which is regarded as a good Echinocythereidine.

Genus *Neocytheretta* van Morkhoven
***Neocytheretta ventrocostata* sp. nov.**

(Figs 117, 118)

Material. HOLOTYPE, — ad. ♂ carapace, NTM Cr.005780, DN. PARATYPES — ad. ♀ carapace, NTM

Cr.005781, DN; 7 carapaces all adult (2 ♂, 5 ♀) plus a disarticulated ad. ♂ LV, RV, on assemblage slide DN, in NTM.

Description. Carapace small-medium sized; subquadrate in lateral view; each valve with much thickened anteromarginal rim and raised marginal ridge that runs from in front of the anterodorsal eye tubercle around the anterior and ventral margin to the posteroventral corner; anterior region behind this rim depressed; rest of surface ornamented by coarse reticulation; median sulcus behind the subcentral tubercle; posterodorsally a short crenulate ridge, posteromedially a short, blunt spine, posteroventrally the reticulate ornament is interrupted by four short but strong ribs (giving the taxon its specific epithet); dorsum straight; anterior broadly rounded, adorned with marginal spines; venter weakly inflexed anteromedially then slopes backwards and upwards to subtruncate posterior; in dorsal view inflated, broadest behind the median sulcus at the region of the posteromedial spine, anterior and posterior thickened, truncated. Inner lamellae very broad, lacking vestibules, line of concrescence irregular as typical for cytherettids; marginal pore canals numerous, long and flexuous; normal pore canals scattered, simple, open; hinge amphidont with crenulate median element; muscle scars located in subcentral tubercle, comprising four adductors frontal sear and two small mandibulars. Sex dimorphism distinct, ♂ more elongate than ♀.

Dimensions. Holotype — L, 0.49; H, 0.24; B, 0.22. NTM Cr.005781 — L, 0.45; H, 0.25; B, 0.23.

Etymology. *venter* (L.) = belly; *costata* (L.) = ribbed.

Family Cytheruridae G.W. Mueller
Genus *Cytherura* Sars

***Cytherura densuireticulata* Hartmann**
(Figs 142-146)

Cytherura densuireticulata Hartmann, 1978: 109-110.

Material. 1 ad. ♀ carapace, NTM Cr.005782, PH1; 1 ♂ carapace, DN, in NTM; 6 carapaces (5 ad., 1 juv.), 1 RV, 3 LV all adult, including both sexes, on assemblage slides PH1 and PH2, in NTM.

Dimensions. NTM Cr.005782 — L, 0.41; H, 0.22; B, 0.19.

Notes. The carapace from Darwin (NTM Cr.005783) while exhibiting the same surface pattern as the Port Hedland specimens seems more heavily reticulate (probably due to a heavier coating of gold before SEM examination). Compare Figs 142 and 143.

***Cytherura nordoccidentalis* sp. nov.**

(Fig. 147)

Type material. HOLOTYPE — ad. ♀ carapace, NTM Cr.005784, PH1; PARATYPE — ad. ♂ LV, NTM Cr.005785, PH1;

Additional Material. 1 carapace, 2 LV all adult including both sexes, on assemblage slides PH1 and PH2, in NTM.

Diagnosis. A *Cytherura* distinguished from other Recent Australian species by the fact that its caudal process is posteromedial rather than subposterodorsal and by a coarsely punctate surface ornament.

Dimensions. Holotype — L, 0.38; H, 0.20; B, 0.18; NTM Cr.005785 — L, 0.41; H, 0.20; B, 0.20.

Etymology. *nord* (AS) = north; *occidentalis* (L.) = of the west.

Genus *Semicytherura* Wagner

***Semicytherura* cf. *cryptifera* (Brady)**

Cytherura cryptifera Brady, 1880:134.

Semicytherura cryptifera — McKenzie 1967:73; Hartmann 1979:243; Hartmann 1980:141.

Material. 1 ad. ♀ LV, NTM Cr.005786, PH2.

Dimensions. NTM Cr.005786 — L, 0.42; H, 0.20.

Notes. Hartmann (1978: Pl. 11, Figs 4-6) recorded and illustrated this taxon from Cervantes, northwestern W.A.

***Semicytherura* sp.**

(Fig. 150)

Material. 1 A-1 juvenile LV, NTM Cr.005787, PH1; and 1 RV, 1 LV both A-1 juv., on assemblage slides PH1 and PH2, in NTM.

Dimensions. NTM Cr.005787 — L, 0.35; H, 0.16.

Notes. This taxon shows some resemblance to *S. paenunuda* McKenzie from Port Phillip Bay, Victoria but is more elongate.

Genus *Hemicytherura* Elofson

***Hemicytherura mackenziei* Hartmann**

(Figs 148, 151)

Material. 1 A-1 carapace, NTM Cr.005788, DN 2 ad. carapaces (1 ♀, 1 ♂), the ♀ carapace lost subsequent to SEM examination, on assemblage slides PH1 and PH2, in NTM.

Dimensions. NTM Cr.005788 — L, 0.33; H, 0.16; B, 0-16.

Genus *Kangarina* Coryell and Fields

***Kangarina* sp.**

(Fig. 152)

Material. 1 A-1 ♀ carapace, NTM Cr.005789, DN.

Dimensions. NTM Cr.005789 — L, 0.34; H, 0.18; B, 0.19.

Notes. This species seems closest to *Kangarina* sp. of Kingma, (1948) from the Late Tertiary of Bodjonegoro, Java, Indonesia.

Genus *Oculocytheropteron* Bate

***Oculocytheropteron* sp.**

Material. 1 juv. carapace, NTM Cr.005790, DN; and 1 juv. RV on assemblage slide DN, in NTM.

Dimensions. NTM Cr.005790 — L, 0.34; H, 0.18; B, 0.27.

Genus *Eucytherura* G.W. Mueller

***Eucytherura* cf. *orientalis* (Kingma)**

(Fig. 149)

Orthonotacythere orientalis Kingma, 1948:93.

Eucytherura orientalis — Hanai, Ikeya and Yajima 1980: 181.

Material. 1, adult ♀ carapace, NTM Cr.005791, DN; 4 carapaces (3 adult ♀, 1 adult ♂), on assemblage slide DN, in NTM.

Dimensions. NTM Cr.005791 — L, 0.33; H, 0.19; B, 0.20.

Notes. Kingma (1948) placed this species in *Orthonotacythere* Alexander but his illustrations make it obvious that the taxon belongs in *Eucytherura*. The general ornamentation and dimensions of our material are nearly identical to his record and illustrations but the indifferent quality of the latter prompts us to use the cf. citation. At this remove from his inspection of Kingma's types, the junior author can no longer be certain that the Darwin material is indeed identical with *E. orientalis*.

DISCUSSION

At species level the assemblages are predominantly endemic to the Australian province but include occasional elements from ancient Tethys (e.g. *Pseudopsammocythere* cf. *reniformis*), southern Africa (e.g. *Mutilus splendideornatus*) and from the southwestern Pacific (e.g. *Bicornucythere* cf. *darwini*). In spite of the presence of some pan-Australian species (e.g. *Papillatabairdia dentata*, *Loxococonchella pulchra*, *Yassinicythere bassiounni*) a distinctive northern Australian fauna is readily identified: richly diverse, and having tropical/subtropical affinities.

With respect to genera, the faunas combine endemics with cosmopolitans. Their links still lie with Tethys, southern Africa and the southwestern Pacific but many distinctive Australian elements are evident. At higher hierarchical levels, these endemic genera characterise the tribe Australimoosellini, the subfamily Arculacythereinae and the family Pectocytheridae. They include *Australimoosella*, *Arculacythereis*, *Praemunita* and *Labutisella*. Additionally, there appear to be several endemic genera in such cosmopolitan families as Bairdiidae (*Papillatabairdia*), Xestoleberididae (*Hedlandella*) and Trachyleberididae (*Actinoleberis*) but further work may show that these are more widespread, especially in the nearby southwestern Pacific. Thus, *Ponticocythereis*, originally described from southeastern Australia is now known to be represented also by several southwestern Pacific species.

Since the Late Miocene impact of the Australian Block against the Indonesian Arc, the intervening shelf seas have provided no barriers to relatively unrestricted movements either way across Wallace's Line by shallow-adapted taxa. For example, the genus *Javanella* and the species '*Actinocythereis*' *scutigera* are common to both Indonesian and northern Australian shelf environments.

ACKNOWLEDGEMENTS

The study initiated at the kindly behest of the senior author in 1970, during a brief visit by the junior author to Professor Howe's department at Louisiana State University, Baton Rouge. Howe had already arranged his assemblages on microslides and indicated several new genera. Some SEM photography

was completed at the British Museum (Natural History) later in 1971 (Figs 153-162). The untimely death of Prof H.V. Howe led to a delay which has lengthened far more than was envisaged originally but had the positive effect of allowing inclusion of the Darwin fauna (collected in 1975).

The junior author has been supported by ARGC Grant No. E74 15107 and AMSTAC Grant No. 2000/1, and gratefully acknowledges use of facilities at Rivcrina-Murray Institute of Higher Education, Wagga Wagga, New South Wales, and the Bureau of Mineral Resources, Canberra, Australian Capital Territory (A.C.T.) Most of the SEM photography was completed at the Australian National University SEM Unit in Canberra with the help of Mr John Preston. Printing of many negatives was enabled by a timely grant from the Northern Territory Museum of Arts and Sciences.

Parts of the taxonomy benefitted from discussions with Dr I. Yassini and Messrs C. Bentley, J.V. Neil and M.T. Warne.

Mrs Wendy Bellamy typed the manuscript.

REFERENCES

- Benson, R.H. 1972. The *Bradleya* problem, with descriptions of two new psychrospheric ostracode genera, *Agrenocythere* and *Poseidonamicus* (Ostracoda; Crustacea). *Smithsonian Contributions to Paleobiology* **12**: 1-135.
- Bonaduce, G., Masoli, M., Minichelli, G. and Pugliese, N. 1980. Some new benthic marine ostracod species from the Gulf of Aqaba (Red Sea). *Bollettino della Societa Paleontologica Italiana* **19** (1): 143-178.
- Bonaduce, G., Masoli, M. and Pugliese, N. 1976. Ostracoda from the Gulf of Aqaba (Red Sea). *Pubblicazioni della Stazione Zoologica di Napoli* **490**: 372-428.
- Brady, G.S. 1866. On new or imperfectly known species of marine Ostracoda. *Transactions of the Zoological Society of London* **5** (5): 359-393.
- Brady, G.S. (1868) 1869. Ostracoda. In: M. de Folin (ed.) *Les Fonds de la Mer*. Parts 1,2: 54-163, 181-247. Folin et Perier: Paris.
- Brady, G.S. 1880. Report on the Ostracoda. *Report on the scientific results of the voyage of H.M.S. "Challenger" during the years 1873-76, Zoology* **1**: 1-184.
- Brady, G.S. 1886. Notes on entomostraca collected by Mr. A. Haly in Ceylon. *Journal of the Linnean Society of London Zoology* **19**: 293-317.
- Chavtur, V.G. 1981. On the systematic position of the modern Ostracoda in the family Polycopidae (Ostracoda, Cladocopina). In: Deep Sea Bottom Fauna of the Pacific Ocean. *Transactions of the P.P. Shirshov Institute of Oceanology* **115**: 53-61 (In Russian).

- De Deckker, P. 1981. Taxonomy and ecological notes on some ostracods from Australian inland waters. *Transactions Royal Society of South Australia* **105** (3): 91-138.
- Doruk, N. 1973. On *Keijella hodgii*. *Stereo-Atlas of Ostracod Shells* **1** (1): 53-56.
- Elofson, O. 1939. Neue und wenig Bekannte Cytheriden von der schwedischen Westküste. *Arkiv Zoologi Stockholm* **30A** (21): 1-22.
- Fyan, E.C. 1916. Eenige Jong-Pliocene ostracoden van Timor. *Verslag Koninklijke Nederlandse Akademie van Wetenschappen Afdeling Wissen Natuurkunde* **23**: 1175-1186.
- Hartmann, G. 1974. Zur Kenntnis des Eulitorals der afrikanischen Westküste zwischen Angola und Kap der Guten Hoffnung und der afrikanischen Ostküste von Sudafrika und Moçambique unter besonderer Berücksichtigung der Polychaeten und Ostracoden. Teil III. Die Ostracoden des Untersuchungsgebiets. *Mitteilungen aus dem Hamburgischen zoologischen Museum und Institut* **69**: 229-520.
- Hartmann, G. 1978. Zur Kenntnis des Eulitorals der australischen Küsten unter besonderer Berücksichtigung der Polychaeten und Ostracoden. Teil 1. Die Ostracoden der Ordnung Podocopida G.W. Müller, 1894 der tropisch-subtropischen Westküste Australiens (zwischen Derby im Norden und Perth im Süden). *Mitteilungen aus dem Hamburgischen zoologischen Museum und Institut* **75**: 63-219.
- Hartmann, G. 1979. Zur Kenntnis des Eulitorals der australischen Küsten unter besonderer Berücksichtigung der Polychaeten und Ostracoden. Teil 3. Die Ostracoden der Ordnung Podocopida G.W. Müller, 1894 der warm-temperierten (antiborealen) West- und Südwestküste Australiens (zwischen Perth im Norden und Eucla im Süden). *Mitteilungen aus dem Hamburgischen zoologischen Museum und Institut* **76**: 219-301.
- Hartmann, G. 1980. Zur Kenntnis des Eulitorals der australischen Küsten unter besonderer Berücksichtigung der Polychaeten und Ostracoden. Teil 5. Die Ostracoden der Ordnung Podocopida G.W. Müller, 1894 der warm-temperierten und subtropisch-tropischen Küstenabschnitte der sud und Südostküste Australiens (zwischen Ceduna im Westen und Lakes Entrance im Osten). *Mitteilungen aus dem Hamburgischen zoologischen Museum und Institut* **77**: 11-204.
- Hartmann, G. 1981. Zur Kenntnis des Eulitorals der australischen Küsten unter besonderer Berücksichtigung der Polychaeten und Ostracoden. Teil 7. Die Ostracoden der Ordnung Podocopida G.W. Müller, 1894 der subtropisch-tropischen Ostküste Australiens (zwischen Eden im Süden und Heron Island im Norden). *Mitteilungen aus dem Hamburgischen zoologischen Museum und Institut* **78**: 97-149.
- Hartmann, G. 1982. Variation in surface ornament of the valves of three ostracod species from Australia. In: R.H. Bate, E. Robinson and L.M. Sheppard (eds) *Fossil and Recent Ostracods*: 365-380. Ellis Horwood: Chichester.
- Hazel, J.E. 1967. Classification and distribution of the Recent Hemicytheridae and Trachleberididae (Ostracoda) off northeastern North America. *United States Geological Survey Professional Paper* **564**: 1-49.
- Hornibrook, N. de B. 1952. Tertiary and Recent Marine Ostracoda of New Zealand: their origin, affinities and distribution. *New Zealand Geological Survey, Palaeontological Bulletin* **18**: 1-82.
- Keiji, A.J. 1953. Preliminary note on the Recent Ostracoda of the Snellius Expedition. *Proceedings of the Koninklijke Nederlandse Akademie van Wetenschappen Series B* **56** (2): 155-168.
- Keiji, A.J. 1954. Some Recent Ostracoda of Manila, Philippines. *Proceedings of the Koninklijke Nederlandse Akademie van Wetenschappen Series B Physical Sciences* **57** (3): 351-363.
- Keyser, D. 1977. Brackwasser-Cytheracea aus Süd-Florida (Crust.: Ostracoda: Podocopa). *Abhandlungen und Verhandlungen des naturwissenschaftlichen Vereins im Hamburg*. **20**: 43-85.
- Kingma, J. Th. 1948. *Contributions to the knowledge of the young Caenozoic Ostracoda from the Malayan region* 1-106. Kemink en zoon: Utrecht.
- Kornicker, L.S. 1986. *Codonocera cuspidata*, a new species of pelagic ostracode from off Queensland, Australia (Crustacea: Ostracoda: Cypridinidae). *Records of the Australian Museum* **38**: 119-134.
- Labutis, V.R. 1977. *Cytheracean Ostracoda from the Great Barrier Reef*. Unpublished M.Sc. (Hons) thesis, Macquarie University: Sydney.
- Liebau, A. 1975. Comment on suprageneric taxa of the Trachyleberididae s.n. (Ostracoda, Cytheracea). *Neue Jahrbuch für Geologie und Paläontologie Abhandlung B* **148** (3): 353-379.
- Logan, B.W. and Cebulski, D.E. 1979. Sedimentary environments of Shark Bay, Western Australia. *American Association of Petroleum Geologists Memoir* **13**: 1-37.
- Maddocks, R.F. 1966. Distribution patterns of living and subfossil podocopid ostracodes in the Nosy Be area, northern Madagascar. *University of Kansas Paleontological Contributions* **12**: 1-72.
- Maddocks, R.F. 1969. Recent ostracodes of the family Pontocyprididae, chiefly from the Indian Ocean. *Smithsonian Contributions to Zoology* **7**: 1-56.
- Malz, H. and Ikeya, N. 1982. On the occurrence of *Sinoleberis* in the Pacific (Ostracoda; Pliocene to Recent; Taiwan and Japan). *Senckenbergiana lethaea* **63** (5/6): 413-427.
- McKenzie, K.G. 1967. Recent Ostracoda from Port Phillip Bay, Victoria. *Proceedings of the Royal Society of Victoria* **80** (1): 61-106.
- McKenzie, K.G. 1972. New data on the ostracode genera *Laocoonella* de Vos and Stock, *Redekea* and *Aspidoncha* de Vos; with a key to the family Xestoleberididae and a resumé of symbiosis in Ostracoda. *Beaufortia* **19**: 151-162.
- McKenzie, K.G. 1976. Sahul Shelf assemblages and the evolution of post-Palaeozoic Ostracoda. *Abhandlungen und Verhandlungen des naturwissenschaftlichen Vereins im Hamburg* **18/19** supplement: 215-228.

- McKenzie, K.G. 1987. Tethys and her progeny. In: K.G. McKenzie (ed.) *Shallow Tethys 2*: 501-523. Balkema: Rotterdam.
- McKenzie, K.G. 1988. A Recent Dutch microorganism (A.J. Keij), with the description of *Jankeijcythere* new genus (Crustacea, Ostracoda). In: T. Hanai, N. Ikeya and K. Ishizaki (eds) *Evolutionary Biology of Ostracoda*: 29-37 Kodansha: Tokyo.
- McKenzie, K.G., Milne, P.W., Bryan, C. and Freeman, K. 1979. Distribution of marine planktonic and benthic Ostracoda in northern Australian waters and some correlated environmental factors. In: N. Kristic (ed.) *Proceedings of the VII International Symposium on Ostracodes, Beograd 1*: 233-236.
- McKenzie, K.G. and Peypouquet, J-P. 1984. Oceanic palaeoenvironment of the Miocene Fyansford Formation from Fossil Beach, near Mornington, Victoria, interpreted on the basis of Ostracoda. *Alcheringa* **8**: 291-303.
- McKenzie, K.G. and Pickett, J.W. 1984. Environmental interpretations of Late Pleistocene Ostracode assemblages from the Richmond River Valley, New South Wales. *Proceedings of the Royal Society of Victoria* **96**(4): 227-242.
- McKenzie, K.G. and Sudijono, 1981. Plio-Pleistocene Ostracoda from Sangiran, Jawa. *Bulletin of the Geological Research and Development Center Bandung Palaeontology Series* **1**: 29-51.
- Mueller, G.W. 1894. Die Ostracoden des Golfes von Neapel und der angrenzenden Meeresabschnitte. *Fauna und Flora des Golfes von Neapel Monographie* **21**: 1-404, pls 1-40.
- Mueller, G.W. 1912. Ostracoda. In: *Das Tierreich Auftrage Königlich Preussien Akademie Wissenschaftlich Berlin Lieferung* **31**: 1-434.
- Omatsola, M.E. 1971. *Campylocythereis*, a new genus of the Campylocytherinae (Ostr., Crust.) and its muscle scar variation. *Bulletin du Centre de Recherche Pau — SNPA* **5** supplement: 101-123.
- Poulsen, E.M. 1962. Ostracoda-Myodocopa Part I Cypriidiformes-Cypridinidae. *Dana Report* **57**: 1-414.
- Poulsen, E.M. 1977. Zoogeographical remarks on marine pelagic Ostracoda. *Dana Report* **87**: 1-34.
- Ruggieri, G. 1953. Ostracodi del genere *Pajienborchella* viventi nel Mediterraneo. *Atti della Societa Italiana di Scienze Naturali e del Museo Civico di Storia Naturale di Milano* **92**: 1-7.
- Sandberg, P.A. 1969. Appendages and family placement of the ostracod genus *Pellucistoma*. *Journal of Paleontology* **43** (5): 1174-1178.
- Schornikov, E. I. and Shaitarov, S.V. 1979. A new genus of Ostracoda from Far-eastern seas. *Biology of the Sea* **2**: 41-47 (In Russian).
- van den Bold, W.A. 1963. The ostracode genus *Orionina* and its species. *Journal of Paleontology* **37** (1): 33-50.
- Wouters, K. 1981. Two new marine podocopid species from Hansa Bay, Papua New Guinea (Crustacea: Ostracoda). *Bulletin Institut Royale des Sciences Naturelles de Belgique* **53** (16): 1-12.

Accepted 16 September 1988

